United States
Department
of Agriculture

Animal and Plant Health
Inspection Service
Wildlife Services

FINAL
AMENDMENT

For the

ENVIRONMENTAL ASSESSMENT: PREDATOR DAMAGE MANAGEMENT IN NEVADA

USDA-Animal and Plant Health Inspection Service
Wildlife Services[1] (WS)

August 27, 2004

I. PURPOSE AND NEED

This document is an amendment to the 1999 Environmental Assessment (EA), "Predator Damage Management in Nevada" (NADCP 1999; hereafter 1999 EA). This amendment has 4 goals: 1) assess the impact of increases in requests for assistance with predator damage management; 2) assess a new alternative for addressing requests for assistance with damage caused by common ravens (*Corvus corax*); 3) assess impacts of Predator Damage Management (PDM) ctivities on 2 Federally listed T&E species that have recently been found or are expected to arrive in Nevada; and 4) provide an update of data in the 1999 EA. This analysis is in addition to that in the 1999 EA and FONSI and all information and analyses in the 1999 EA remains valid unless otherwise noted below.

1.1. INTRODUCTION

An Environmental Assessment (EA) was prepared in 1999 to evaluate that portion of WS' responsibility in Nevada to resolve conflicts with predators (NADCP 1999). The EA evaluated the need for a WS program to addresses problems with predation on livestock, wildlife and pets, predator damage to property and other resources, and threats to human health and safety. The EA assessed the relative effectiveness of six alternatives to meet that need and the potential environmental effects of these activities. Public input and data in the EA were used to select a program of Integrated Wildlife Damage Management to address conflicts with predators in Nevada in the EA's Finding of No Significant Impact (FONSI) issued July 15, 1999. The EA was tiered to the WS programmatic Environmental Impact Statement (EIS) (USDA 1997, Revised). Copies of the EA are available for review from the State Director, USDA, APHIS-WS, 4600 Kietzke Lane, Building O-260, Reno, Nevada 89502. An electronic version of the EA is available at www.aphis.usda.gov/ws/eafrontpage.html. Copies of the EIS are available from the USDA, APHIS, WS Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

WS has reviewed the EA in monitoring reports to determine if the impacts on the quality of the human environment from the activities conducted pursuant to the 1999 EA's FONSI/ROD have changed substantially from what was described in the EA. Monitoring is used to measure the effectiveness of mitigation procedures, the effects of actions on the environment, and program compliance with laws, regulations, policies, direction, and decisions. New conditions were detected in Fiscal Year 2001 (FY01 - October 1, 2000 to September 30, 2001) and FY02 monitoring reports that WS felt required further analysis. The new analysis, presented in this amendment to the 1999 EA, will determine the environmental effects of changes and updates to the PDM program. The alternatives examined in the 1999 EA (renumbered in this amendment)

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[1] The USDA, APHIS, Animal Damage Control Program was officially renamed Wildlife Services in August of 1997.

will be examined in light of this new information and a new alternative for addressing increasing damage by ravens will be presented. A new Decision will be issued using the analysis in the amendment and information obtained during a 30 day public comment period on the amendment. A summary of public comments received during the public comment period is contained in Appendix B.

WS PDM is conducted in cooperation with other Federal, State, and local agencies, as well as private organizations and individuals. WS cooperates with livestock associations and supervises the Predatory Animal and Rodent Committee (PARC). PARC is supervised by WS through the Division of Resource Protection, an entity of the Nevada Department of Agriculture (NDOA). These two entities, WS and the Division of Resource Protection, form the Nevada Animal Damage Control Program (NADCP). NADCP has been conducting PDM in Nevada for over eighty years, and has changed PDM activities and methods to reflect societal values and minimize impacts on people, wildlife, and the environment.

The majority of the funds for the program come from private, State, and Federal cooperators with WS funds covering only a relatively small portion of the costs. For example, in Nevada, all work to protect and enhance natural resources is funded by the State. The program's work with agriculture is 50-50 funded by the State and WS, with most of the State funding going to the field (actual direct control work) and most of the Federal funding covering supervision and management. Federal funds cover safety, training and maintenance cost for the aircraft used in aerial hunting, but the costs of flying the aircraft for predation management are paid by the Nevada Grazing Boards.

1.2 NEED FOR ACTION

Predators are responsible for injury and loss of a wide variety of domestic animals including cattle, goats, sheep, swine, exotic pen-raised game, other hoofed-stock, poultry, and pets. Predators also impact a number of other resources throughout Nevada including other agricultural resources, property and natural resources (e.g. wildlife). Predators can represent a threat to human health and safety. For example, in FY99 12 people in Nevada were bitten by coyotes to the extent that medical attention was required. The predators that cause the majority of conflicts are coyotes (*Canis latrans*), common ravens, mountain lions (*Felis concolor*), striped skunks (*Mephitis mephitis)*, feral/free roaming dogs (*C. familiaris*), bobcats (*Lynx rufus*), raccoons (*Procyon lotor*), and badgers (*Taxidea taxus*). Other predators in Nevada have historically caused only localized damage on a sporadic basis including black bears (*Ursus americanus*), feral/free roaming cats (*Felis domesticus*), minks (*Mustela vison*), long-tailed weasels (*M. frenata*), short-tailed weasels (*M. rixosa*), spotted skunks (*Spilogale putorius*), gray fox *(Urocyon cinereoargentus*), red fox (*Vulpes vulpes*), kit fox (*V. macrotis*), and ringtails (*Bassariscus astutus*). Table 1 gives the requests for assistance by category over the last 5 fiscal years (FY99-FY03). Data (FY98) from the 1999 EA are given for comparison.

Total requests for assistance increased from 1998-2000 and have subsequently remained relatively stable. Requests for assistance have basically remained the same for most species with the exception of requests for assistance involving bobcats, raccoons, and ravens. Requests for assistance or these species have at least doubled since the 1999 EA and have shown an increasing trend. The number of requests for assistance involving ravens has more than tripled from FY98 to FY03. Increases are greatest for requests for assistance with raven-related risks to human health and safety. Of the three species showing increases in complaints, NADCP has primary responsibility for only ravens. Bobcat and raccoon complaints are usually managed by NDOW, but NADCP does give technical assistance and some direct control assistance for these species. For instance, NADCP loans out cage traps to the public to capture problem raccoons and will take bobcats that have killed livestock. Requests for black bear management increased in FY01, but this is likely a result of sporadic damage because bear damage complaints, in general, have remained fairly stable and FY02 and FY03's data again show complaints below 10.

Table 1. Requests for assistance with different predator species in FY98-FY03.

OCCURRENCES OF CONFIRMED AND REPORTED DAMAGE																		
Resource	**Agriculture**						**Property**						**Human Health and Safety**					
Fiscal Year	**98**	**99**	**00**	**01**	**02**	**03**	**98**	**99**	**00**	**01**	**02**	**03**	**98**	**99**	**00**	**01**	**02**	**03**
Badger	1	-	1	2	2	2	5	3	3	7	2	2	1	1	4	3	-	-
Black bear	6	6	7	20	4	1	4	3	-	1	3	-	-	4	-	-	-	1
Bobcat	5	9	10	11	39	19	2	1	1	5	4	4	1	-	-	7	2	7
Feral cat	2	1	-	1	-	-	7	6	3	2	4	6	-	3	3	6	2	3
Coyote	694	819	930	918	757	710	95	114	140	147	125	67	73	136	195	117	114	91
Feral dog	6	18	33	12	14	16	-	-	-	-	-	-	1	2	-	1	-	1
Gray fox	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	2	-
Kit fox	-	-	-	-	-	-	-	-	9	-	-	-	1	-	14	2	1	-
Red fox	-	1	-	2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Mountain lion	165	168	249	168	134	88	1	3	2	-	3	-	5	10	1	12	18	16
Raccoon	13	10	11	13	2	4	63	103	143	134	151	200	23	44	32	95	121	136
Common raven	21	15	35	57	89	32	6	1	4	5	14	3	4	8	3	5	33	198
Spotted skunk	-	-	-	-	-	-	-	1	-	1	-	-	-	1	-	3	-	-
Striped skunk	2	1	1	-	2	1	100	57	68	60	57	94	48	64	69	57	15	23
Weasels/ Ringtail	-	-	-	1	-	1	1	1	-	-	-	1	-	2	-	-	3	1
Total	**915**	**1048**	**1277**	**1205**	**1046**	**876**	**284**	**293**	**373**	**362**	**364**	**377**	**157**	**275**	**322**	**308**	**311**	**477**

Table 1. Public requests for NADCP assistance with different predator species in FY98-FY03 (cont.)

REQUESTS FOR ASSISTANCE												
Resource	**Natural resources**						**Total**					
Fiscal Year	**98**	**99**	**00**	**01**	**02**	**03**	**98**	**99**	**00**	**01**	**02**	**03**
Badger	-	-	1	-	-	-	**7**	**4**	**9**	**12**	**4**	**4**
Black bear	-	-	-	-	-	-	**10**	**13**	**7**	**21**	**7**	**2**
Bobcat	-	-	-	-	2	2	**8**	**10**	**11**	**23**	**47**	**32**
Feral cat	-	3	4	5	6	3	**9**	**13**	**10**	**14**	**12**	**12**
Coyote	-	2	9	8	7	7	**862**	**1017**	**1274**	**1190**	**1003**	**875**
Feral dog	-	-	-	1	-	-	**7**	**20**	**33**	**14**	**14**	**17**
Gray fox	-	-	1	-	-	-	**--**	**--**	**2**	**--**	**3**	**--**
Kit fox	-	-	-	-	-	-	**1**	**--**	**23**	**2**	**1**	**--**
Red fox		-	-	-	-	-	**--**	**1**	**--**	**2**	**3**	**2**
Mountain lion	-	-	-	1	54	34	**171**	**181**	**252**	**181**	**209**	**138**
Raccoon	-	-	-	1	1	-	**99**	**157**	**186**	**243**	**275**	**340**
Common raven	-	6	33	22	160	152	**31**	**30**	**75**	**89**	**296**	**385**
Spotted skunk	-	-	-	-	-	-	**--**	**2**	**--**	**4**	**--**	**--**
Striped skunk	-	-	-	-	-	-	**150**	**122**	**138**	**117**	**74**	**118**
Weasels/ Ringtail	-	-	-	-	-	-	**1**	**3**	**--**	**1**	**3**	**3**
Total	**0**	**11**	**48**	**38**	**230**	**198**	**1356**	**1573**	**2020**	**1913**	**1951**	**1928**

The magnitude of predator damage problems is also reflected in the value of losses reported to or verified by WS. However, in some instances one damage complaint can represent substantial losses such as the loss of high-value breeding stock. Figure 1 gives the value of reported damage for coyotes, ravens, and mountain lions, and the combined value of reported damage for all predators in Nevada from FY98 to FY02. Damage for coyotes has fluctuated from FY98 to FY02. Damage for ravens has increased from FY98 to FY02 and declined in FY 2003. Confirmed and reported mountain lion damage has generally decreased from FY98 to FY03, but reported and confirmed damages (Table 1) and WS take of lions do not show a similar decline. This difference is due, in part, to the fact that the WS data tracking system (MIS) primarily reflects agriculture related losses and is not well suited to accurately reflect monetary losses for human health and safety or natural resource loss incidents. Requests for assistance involving mountain lion depredation on horses, pets and wildlife, and threats to human health and safety have increased. Predation on pets and wildlife and threats to human health and safety are reported without estimates for economic cost. These types of incidents often have associated costs which can be substantial. For example, one way to estimate the value the public places on wildlife is to consider what individuals are willing to pay for auctioned hunting permits (Sielecki 2000). A permit for bighorn sheep hunting in Oregon that is available at an annual action has sold at auction for as high as $110,000 (Associated Press 2004). Auctions for desert bighorn sheep permits in Utah start at 30,000 (Utah Administrative Code Rule R657-47). Funds from the auctioned permits go to aid in bighorn sheep management and restoration efforts. For FY98 - FY01 and FY03 combined total value for damage caused by all predators mostly reflects coyote damage as coyotes were responsible for an average of 66% of the damage caused by all predators combined. However, in FY02 confirmed and reported damage by ravens surpassed damage by coyotes. The increase in the FY02 level of raven damage may be related, in part to the initiation of a number of new raven damage management projects.

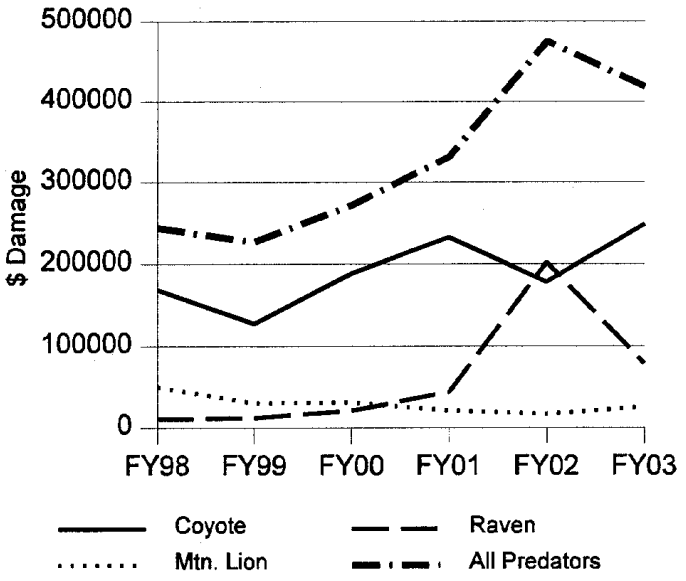

Figure 1. The total value of damage documented by NADCP (confirmed and reported losses combined) for coyotes, ravens and mountain lions, and the combined value of all predator damage recorded by WS in Nevada for FY98 to FY03

NADCP has been contracted by the Nevada Department of Wildlife (NDOW) and Clark County to conduct damage management activities targeting specific predators for the protection of other wildlife species including threatened and endangered (T&E) species. These types of activities were covered by the scope of the 1999 EA. NDOW has contracted the services of NADCP to conduct coyote damage management for the protection of antelope (*Antilocapra americana*) and sharp-tailed grouse (*Tympanuchus phasianellus*), raven damage management for the protection of sharp-tailed grouse, sage grouse (*Centrocercus urophasianus*), turkeys (*Meliagris gallopavo*), waterfowl, and other species of birds, and mountain lion damage management for the protection of bighorn sheep. The addition of these contracted projects has increased NADCP's efforts focused on these three predator species. NADCP has also been contracted by Clark County's Department of Environmental Planning to conduct raven damage management efforts for the protection of the desert tortoise (*Gopherus agassizii*), a Federally listed Threatened species. This has also increased NADCP's efforts focused on ravens. Additionally, NADCP has been contracted by Clark County's Department of Environmental Planning to conduct feral cat damage management for the protection of the Palmer's chipmunk (*Eutamias palmeri*).

WS anticipates receiving requests in 2004-2005 to help reduce predation on sage grouse, mule deer, bighorn sheep, desert tortoise, and Palmer's Chipmunk. The desert tortoise is a Federally listed threatened species. Palmers Chipmunk is Federally classified as a species of concern. Sage grouse, mule deer, and bighorn sheep populations in some sections of Nevada are sufficiently healthy that NDOW allows sport harvest of these species. However in other sections of the state, NDOW has not reached management goals for these populations and may request NADCP to conduct PDM activities in an effort to enhance local populations of these species.

In addition to an increase in raven work for natural resource protection, raven damage management for the protection of other resources has increased annually since the 1999 EA was written. The biggest increase in raven damage management has been for livestock, primarily calves, and other agricultural resources. NADCP also started conducting raven damage management for the protection of new resources. For example, county health departments have cited several landfills in Nevada because they have been concerned with congregations of hundreds of ravens at the landfills (R. Beach, WS, pers. comm.). When ravens congregate at landfills, their flocks pose a health and safety threat to people because the ravens will scavenge through the refuse and often carry potentially hazardous refuse from the landfill to human habitations. Raven feces accumulates on equipment at the landfill and poses a health and safety risk to landfill employees. The increased damage complaints and new resources being protected have resulted in more focus by NADCP on raven damage management.

NADCP has increased its assistance in disease surveillance for Nevada Health Departments and others by collecting blood samples from captured animals. From FY98-03, NADCP obtained 20, 196, 396, 631, 300, and 496 blood samples respectively from mammalian predators to test for the presence of a plague titer (primarily coyote blood samples), and, 0, 0, 1, 47, 20, and 86 blood samples from ravens to test for West Nile virus. As is reflected by the number of samples taken, NADCP's assistance in this area has increased substantially since the EA was written. These samples were obtained opportunistically from animals taken during regular PDM activities. NADCP disease monitoring work did not result in additional predator mortality above what would have been conducted for other damage management programs. Plague blood samples have helped the State Department of Health identify plague "hot-spots" within Nevada. The Health Department has placed out warning signs notifying the public of the potential for disease contact areas. The first case of West Nile virus in Nevada was confirmed on July 15, 2004. West Nile virus is a zoonotic disease that was first reported to be in the United States in 1999. NADCP is collecting blood samples from ravens taken by the program. Ravens are a good indicator species for detecting the virus.

One additional concern is the increase in requests for assistance with raccoon problems between FY98 and FY03. The majority of raccoon damage complaints have come from urban areas. The raccoon population in urban areas of Nevada is substantially higher than would be expected in the predominantly desert habitat that was transformed by recent development. This species is known to adapt to and flourish amidst human activities. One concern associated with urban raccoons is the presence of the raccoon roundworm (*Baylisascaris procyonis*). The raccoon roundworm is a parasite that can cause serious health problems in humans (CDC 2002). Raccoon roundworms and eggs were found in fecal samples provided by NADCP to the Washoe County Health Department in FY99 and again in FY02. The increase in raccoon related damage and the potential for disease transmission has raised concern in many residential areas. Many urban residents would like to see urban control programs targeting the removal or reduction of raccoons as well as other predators. As stated above, raccoon complaints are usually handled by NDOW, but NADCP does provide technical assistance and may loan out cage traps to the public to capture problem raccoons.

2.0 ISSUES

Issues in the 1999 EA were focused into different areas of the biological, physical, sociocultural, and economic environments that could be affected by the NADCP program under the 6 alternatives. The 1999 EA assessed important and controversial issues identified by agencies, including NADCP, and the public as being likely to be affected by NADCP program activities. The following issues were identified during scoping and previous NEPA processes as areas of concern requiring detailed analysis in the 1999 EA:

- Effects on Target Predator Species Populations
- Effects on Non-target Species Populations, Including T&E Species
- Humaneness of Control Techniques
- Effects on Recreation (hunting and nonconsumptive uses)
- Impacts on Public Safety and the Environment (e.g., effects of toxicants and hazardous materials)
- Effectiveness of NADCP
- Impacts on Special Management Areas (such as Wilderness Study Areas)
- Indirect and Cumulative Impacts
- Cost Effectiveness

3.0 ALTERNATIVES

3.1 DESCRIPTION OF THE ALTERNATIVES

Six potential alternatives were developed to address the issues identified above in the 1999 EA. The following summary provides a brief description of each alternative and the changes in the alternatives that have been made for this amendment.

In the 1999 EA, Alternative 1 was the "No Action" alternative as defined by the Council on Environmental Quality for ongoing programs. This alternative would have allowed NADCP to continue PDM under nine different EAs on public property and one for private property. The difficulty with this was that NADCP Wildlife Specialists would have had to be aware of several different policies for work on the different lands under agreement because each decision was different and formulated different strategies for PDM. This created confusion for NADCP personnel and, therefore, it was determined that this alternative was not as effective as being under a consistent statewide EA as discussed in Alternative 5. Ultimately, Alternative 5 was selected as the current program in the FONSI/ROD for the 1999 EA. Alternative 1 is no longer applicable because PDM has been conducted under Alternative 5 since 1999. Therefore, Alternative 5 in the 1999 EA is now the "No Action" (ongoing program) Alternative and will be Alternative 1 in this Amendment .

Alternative 6, Expanded Federal PDM Program, from the 1999 EA, has also been omitted from this analysis. In the 1999 EA, this alternative included the current program plus increased PDM activities throughout Nevada. This was not selected because it was based on funds contingent for such activities and it was determined that expanded PDM activities could better be addressed in an amendment to the EA like the one you are currently reading.

The following description of the alternatives is supplemental to that provided in the 1999 EA and focuses on changes to the program that have occurred since the 1999 EA was written. Readers are encouraged to check the 1999 EA for a detailed description of the alternatives.

Alternative 1 - Current Program, the "Proposed Action" This was the Proposed Action (Alternative 5) in the 1999 EA and is a continuance of the current program under one all-inclusive EA. Thus, this alternative has become the "No-Action" Alternative (as defined by the Council of Environmental Quality for ongoing programs) since it is the current NADCP program. It is also the Proposed Action, Preferred Alternative, in this amendment. It allows NADCP to use the full range of legally available PDM techniques in an integrated pest management program to respond to all requests for PDM in Nevada.

The objective of PDM, as conducted in the proposed action, is to reduce loss or the risk of loss to all resource categories from predators. NADCP's response to requests for assistance from the public is through technical assistance (advice or demonstrations) or direct damage management. NADCP employees will provide technical assistance to resource owners covering a variety of methods that can be used to resolve problems including information on when and where it is appropriate for the resource owners to resolve the problem on their own. NADCP will also assist resource owners through educational programs on damage identification, prevention, and control, and by providing information on sources of supply

for PDM materials such as pyrotechnics and propane cannons or by temporarily loaning some supplies such as cage traps. Direct control support will mostly be provided for situations that require the use of methods and techniques that are difficult or dangerous for the public to implement, especially those that involve lethal control measures. Direct control efforts often require costly expenditures for supplies and staff hours and, therefore, are most often provided in situations where cooperative funding is available. Resource owners that are given direct control assistance would be encouraged to use additional management strategies and sound husbandry practices, when and where appropriate, to further reduce conflict situations.

Although WS and its cooperators prefer non-lethal techniques whenever effective and practical non-lethal options are available, these strategies are not always sufficient to resolve the damage problem. WS has received requests to provide examples of non-lethal strategies used to reduce predator damage and situations where non-lethal strategies are not always effective, especially as PDM methods relate to conflicts with ravens.

Ravens at landfills can access trash in one of two ways. First, they can get trash from uncovered garbage, second, they can access trash that has been uncovered by the activities of other species (e.g. dogs and coyotes digging up garbage). Corvids can carry trash materials (garbage) out of the landfill resulting risks to human health and safety in the area surrounding the landfill. Congregation of ravens at landfills also results in accumulations of fecal matter which are a heath and safety risk to landfill personnel. Landfill operators fence their landfills to keep out coyotes and free-roaming dogs. Landfill operators make a continual effort to keep the trash covered by dirt. Too little dirt and the trash is not sufficiently covered to keep the birds away, too much dirt and the life expectancy of the landfill is reduced. Finding replacement areas for landfills to move to are very difficult and no one wants a landfill to "fill up".

Even though landfill operators make an attempt to keep their garbage covered they still have to work with the delivery and dumping of the garbage. Corvids tend to hangout at the landfill and mob the delivery truck at the dumping time. In the short period of time from when the truck starts to dump and when the truck clears the area and the landfill operator can push in cover dirt (and there may be other trucks lined up to dump) the ravens swarm over the dumped garbage. Harassing of the birds at this time can exacerbate health concerns because the ravens take garbage and fly to less hostile areas to feed. In Henderson, birds at the landfill are known to frequent the local highschool's common area where students eat lunch. The ability of corvids to persist in obtaining garbage despite the best efforts of the landfills to address the issue is the reason why lethal methods may be applied to reduce corvid numbers/ and associated problems at landfills.

Power companies which operate power lines and poles have changed designs to reduce attractiveness for nesting ravens, have added perch deterrents (spikes), and have conducted nest relocation and harassment. These techniques have been in practice for long periods. Harassment is sometimes effective for the short term but is not a good long term solution as it is not feasible over large expanses. Ravens become accustomed to harassment strategies over time. Often ravens just move down one pole each time they are harassed.

Orchards use pyrotechnics, including propane cannons, however, as discussed above, ravens tend to become accustomed to harassment strategies, rendering these methods less effective over time. In urban and suburban areas, pyrotechnics are not practical because homeowners and law enforcement officers complain of the loud noise that may be a violation of local ordinances.

Livestock producers have learned that limiting their lambing/calving period to a short period of time and congregating the birthing animals into a relatively small area reduces the extent of damage predators such as coyotes, wolves, bobcats and mountain lions will cause as compared to extended birthing periods spread over a wide area. By grouping the vulnerable animals together, both in time and space, reduces the degree of exposure of each

individual. Unfortunately, while this practice protects the calves from predators such as coyotes it increases the attractiveness of the site to predators such as ravens. Synchronizing birthing schedules and congregating livestock in a small area results in an abundance of birthing materials (placentas, dead calves, etc.) which are extremely attractive to the omnivorous raven. Large numbers of ravens are attracted to an area where food is readily available and they aggressively compete for a share of the food. Unfortunately, calves and/lambs intermingled with the afterbirth materials become identified as food items. The ravens peck out eyes, rupture navels, pull tongues out and eat anal orifices of the vulnerable young animals. Thus, the strategy which protects the young from canid predation makes them vulnerable to corvid predation.

No change in methods used by WS for PDM other than new Special Local Need (SLN) pesticide labels for DRC-1339 that were approved for use in Nevada. Use of DRC-1339 is discussed in the 1999 EA. The new DRC-1339 labels allow raven control to protect apple and nut orchards, landfills, and electrical facilities such as power poles. Label changes for wildlife and threatened and endangered species also allow NADCP to use DRC-1339 to respond to request from NDOW to manage raven predation If this alternative is selected, the annual number of ravens removed for damage management is estimated to be approximately 2,400 ravens per year with a maximum of 3,000 ravens per year.

Alternative 2 - No Federal NADCP PDM. This alternative would consist of no Federal involvement in PDM activities in Nevada. Neither direct operational management nor technical assistance would be provided by the Federal members (WS) of NADCP. Information on future developments in non-lethal and lethal management techniques that culminate from WS's research branch would not be as readily available to producers or resource owners. Under this alternative, wildlife damage conflicts would be addressed by NDOW, private resource owners and managers, private contractors, or other government agencies. If WS chooses to not provide the PDM services that NADCP feels are necessary, the State would likely rescind the Federal management of that program, and the Nevada Department of Agriculture would probably handle agriculture related PDM complaints.

In the event that professional PDM assistance is eliminated, it is probable that some resource owners/managers would try to use PDM methods in an unsafe and improper manner, such as the illegal use of pesticides. The avicide DRC-1339 is a special use pesticide and can only be used under direct supervision by WS employees. Consequentially, this technique would not be available under this alternative. Therefore, the methods available under this alternative have not changed from what is described in the 1999 EA

Alternative 3 - Non-lethal Management Only. This alternative would allow NADCP to provide technical information and operational assistance with non-lethal control techniques, such as guard dogs, frightening devices, chemical repellents, harassment, fencing, exclusion, animal husbandry, modification of human behavior, habitat modification, and some use of cage traps and immobilization where relocation is an option. NADCP would also loan equipment used for non-lethal control. Information and training on lethal control methods would not be provided by NADCP. NADCP would only be authorized to assist in lethal predator control activities when control work is necessary for public safety. Lethal PDM methods and control devices could still be applied by persons other than NADCP even though they may have little or no training or experience. The use of inexperienced or untrained personnel could require more effort and cost to achieve the same level of problem resolution, and could cause harm to the environment, including a higher take of non-target animals. As discussed for Alternative 2, frustrated resource owners/mangers may use some PDM methods improperly. The avicide DRC-1339 is a special use pesticide and can only be used by WS employees, so this technique would not be available under this alternative. The methods available under this alternative have not changed from what is described in the 1999 EA.

Alternative 4 - Non-lethal Required before Lethal Control. This alternative would require that: 1) permittees or landowners show evidence of sustained and ongoing use of non-lethal techniques aimed at preventing or reducing predation, prior to receiving the services of NADCP; 2) employees of NADCP use or recommend appropriate non-lethal techniques in response to a confirmed damage situation prior to using lethal methods; and 3) lethal techniques be used only when the use of non-lethal techniques has failed to keep damage below an acceptable level as indicated by the cooperator. If non-lethal methods were found to be ineffective, then the full range of lethal methods would be available for use including the two new special use labels for DRC-1339. If this alternative is selected the annual number of ravens removed for damage management is estimated to be similar to or slightly lower than Alternative 1. Producers would still have the option of implementing lethal control measures on their own and NADCP would continue to recommend lethal control when and where appropriate. However, as with Alternatives 2 and 3, non-WS programs would still not have access to DRC-1339.

Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. This alternative would be identical to Alternative 1 in all respects except that efforts to manage damage associated with ravens would be increased. Under this alternative, additional private and/or Federal resources would be available for raven depredation management. No new techniques for raven damage management would be used, but the maximum number of ravens removed for wildlife damage management would be 6,000 ravens per year.

3.2 STANDARD OPERATING PROCEDURES

The following changes have been made to the list of standard operating procedures in the 1999 EA.

Effects on Target Species Populations

- PDM agreements are made on a limited number of sites in any given year, and the agreements are based upon wildlife conflicts as they arise. It is not expected that the total land area under agreement for PDM would change greatly.

Effects on Non-target Species Populations, Including T&E Species

- NADCP has adopted and implemented all reasonable and prudent measures and terms and conditions for the protection of T&E species that were identified by the USFWS in their 1992 Biological Opinion (USDA 1997, Revised) on WS's nationwide program. The 1992 USFWS Biological Opinion has been updated for the NADCP in a consultation completed on March 27, 2003. The NADCP has adopted all requirements for the protection of T&E species established as a result of this consultation. These requirements are described in Section 4.2 of this amendment.

4. ENVIRONMENTAL IMPACTS

For this Amendment, four of the nine issues addressed in the 1999 EA have not had any substantive changes. NADCP did not identify any new concerns with Humaneness (Issue 3), Impacts on Special Management Areas (Issue 7), Indirect Impacts (Issue 8), and Cost Effectiveness (Issue 9) and these will not be discussed for Alternatives 1-4 in this Amendment as they were addressed in detail in the 1999 EA. They will all be discussed for Alternative 5 because this is a new alternative. The issues that will be discussed for all alternatives are:

- Effects on Target Predator Species Populations
- Effects on Non-target Species Populations, Including T&E Species
- Effects on Recreation (hunting and nonconsumptive uses)
- Impacts on Public Safety and the Environment (e.g., effects of toxicants and hazardous materials)
- Effectiveness of the Program

The 1999 EA analyzed these issues in detail with data from FY94-FY98 to assess the impact of NADCP on the environment. To determine if impacts with regard to these issues have remained within parameters described in the 1999 EA, NADCP regularly monitors data that relate to each of the 9 environmental issues raised in the 1999 EA. The following discussion is a compilation of the monitoring reports for FY99-FY03.

4.1 IMPACT ON TARGET SPECIES POPULATIONS

The following tables consider cumulative impacts (NADCP and private harvest) on predator species which are taken during NADCP PDM activities, and include all target and non-target captures for each species. The mammalian predator population estimates for Nevada were derived from the best scientific information available at the time the 1999 EA was developed. The same population estimates have been used in the monitoring reports for the impact analyses for mammalian predators because, in Nevada, these populations appear to be fairly stable (San Stiver, NDOW, pers, comm. 2002). Improved estimates of the mountain lion population were available from NDOW and have been incorporated in this analysis. The evaluation of raven population impacts in Nevada includes more precise information because the analysis in the monitoring reports indicated that changes in the raven population in the Western US and changes in NADCP raven damage management activities merited additional analysis. The number of predators taken as a result of PDM activities, can, and often does vary from year to year as a result of many different factors including availability of prey or other food, disease, and limiting climatic conditions such as drought.

For most species, the level of effort NADCP applies toward the resolution of problems is typically related to the number of requests for assistance, new issues or concerns for that species, and/or the capability of conducting PDM activities with available funding. In general, when predator populations increase, the occurrence of damage caused by the predators increases which results in increased PDM activities and, thus, take. Likewise, when predator populations decrease, the occurrence of damage caused by the predators tends to decrease, which results in less PDM activities and, thus, less take. Because of this close coordination of "response to event" take tends to be consistent with increases and decreases in target species population levels.

4.1.1 Coyote Population Impact Analysis

Alternative 1 - Modified Current Program, the "Proposed Action". As discussed in the 1999 EA, coyotes were responsible for the largest percentage requests for assistance. As a result of these requests, NADCP has taken an average of 5,443 coyotes annually from FY99 to FY03 with a high of 7,020 in FY00. This is similar to the level of take analyzed in the 1999 EA with the exception of FY00. Thus, the data indicate that NADCP's coyote take has remained basically stable with fluctuations ranging from 4,597 to 7,020 coyotes taken per year. A population model developed by Pitt et al. (2001) assessed the impact of removing a set proportion of the coyote population in one year and then allowing the population to recover (referred to as "pulse removal"). In the model, all populations recovered within 1 year when <60% of the population was removed. The population recovered within 5 years when 60-90% of the population was removed. Pitt et al. (2001) stated that actual coyote populations would recover even more quickly than the model indicated, because the model assumed coyote territories were retained even at low densities, that animals would not move out of their territories to mate, and that animals were not allowed to move in from surrounding areas (no immigration). The model also did not allow for a reduction in natural mortality rates at low population densities. Pitt et al. (2001) also evaluated the impact of removing a set proportion of the population every year for 50 years (sustained removal). When the removal rate was <60% of the population, the population size was the same as for an unexploited population. However, there was a shift in population structure. For example, the population with 50% removal had fewer transient animals, a younger age structure, and higher reproduction. Sustained removal rates of >70% of the population resulted in removal of the entire population after 7 years, but the authors acknowledged

that annual removal of 70% of the population would become increasingly difficult at low densities. Because of the model limitations described above for pulse removal, natural populations are probably able to withstand greater levels of harvest than indicated by Pitt et al. (2001). These findings are consistent with an earlier model developed by Connolly and Longhurst (1975), and revisited by Connolly (1995) which indicated that coyote populations could withstand an annual removal of up to 70% of their numbers and still maintain a viable population.

Calculations using the low estimate for Nevada's coyote population and data for NADCP's take and private harvest showed that the potential combined coyote take ranged from 10% to15% (FY99 - FY03) of the population (Table 2), less than one-fifth the threshold of sustainable harvest. Therefore, NADCP concludes that the coyote population in Nevada has not been adversely impacted by NADCP. This conclusion is consistent with the U.S. General Accounting Office (GAO 1990) assessment regarding WS' impacts on coyote populations in the western U.S.

Alternative 2 - No Federal NADCP PDM. The conclusions of the 1999 EA are anticipated to remain the same under current conditions. Under this alternative, the amount of professional oversight in Wildlife Damage Management would diminish but would still be available to some extent through PARC. In the 1999 EA, the reduction in professional oversight was anticipated to result in similar or slightly higher impacts on target species populations than described for Alternative 1 because the individuals conducting the work may not have the same access to training and current PDM tools and techniques as the Federal NADCP PDM specialists.

Alternative 3 - Non-lethal Management Only. Impacts of Alternative 3 are anticipated to be the same as those described for target predator populations in the 1999 EA. Non-lethal management alternatives do not always reduce predation to acceptable levels, so other government agencies, private individuals, and organizations are anticipated to assume responsibility for use of lethal control techniques. The NADCP would not take any coyotes but cumulative coyote take may increase depending on the training and techniques available to the individuals assuming responsibility for lethal control.

Table 2. Coyote impact analysis of NADCP take and private harvest in Nevada for FY99-FY03.

YEAR	FY99		FY00		FY01		FY02		FY03	
Est. Coyote Population	Low	High	Low	High	Low	High	Low	High	Low	High
	55,000	110,000	55,000	110,000	55,000	110,000	55,000	110,000	55,000	110,000
NADCP Take	4,597	4,597	7,020	7,020	5,978	5,978	4,826	4,826	4,795	4,795
Other Take (Kill)*	1,003	1,003	1,202	1,202	1,185	1,185	1,071	1,071	1,340	1,340
Total Take	5,600	5,600	8,222	8,222	7,163	7,163	5,897	5,897	6,135	6,135
NADCP Take - % of pop.	8%	4%	13%	6%	11%	6%	9%	4%	9%	4%
Other Take* - % of pop.	2%	1%	2%	1%	2%	1%	2%	1%	2%	1%
Total Take - % of pop.	10%	5%	15%	7%	13%	7%	11%	5%	11%	5%
Allowable Harvest	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
Significant	No	No	No	No	No	No	No	No	No	No

* Other take - Coyotes taken by sources other than NADCP including sport hunting/trapping.

Alternative 4 - Non-lethal Required before Lethal Control. Impacts of Alternative 4 are anticipated to be the same as those described for target predator populations in the 1999 EA. Impacts of the NADCP on the coyote population would be similar to or slightly higher than Alternative 1 because most producers have already tried non-lethal techniques prior to requesting assistance from NADCP. However, private efforts at lethal preventive predation management are likely to increase because NADCP would no longer be able to offer this service. As discussed above for Alternatives 2 and 3, this

increase in use of alternative sources of PDM may result in an increase in cumulative coyote take depending on the training and resources available to the individuals conducting the work.

Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. - Increased take of ravens would not impact take of species like coyotes because the majority of ravens are taken with DRC-1339 which, when used in accordance with label directions does not pose a risk to coyotes. The remaining birds are taken by shooting which also does not pose a risk to coyotes, since shooting is target specific. Therefore, the impacts of this alternative on coyote populations are identical to Alternative 1.

4.1.2 Common Raven Population Impact Analysis

Alternative 1 - Modified Current Program, the "Proposed Action". The common raven, the largest bodied of the passerines, is geographically and ecologically one of the most widespread naturally occurring birds in the world. The current raven population level in the Western United States is considered to be higher than it has ever been recorded and raven numbers are rebounding in some of the raven's eastern range in the Appalachians (Boarman and Heinrich 1999).

In many areas of the West, the raven is seen as an indicator of human disturbance because it is often associated with garbage dumps, sewage ponds, highways, agricultural fields, urbanization, and other typical signs of human-altered landscapes (Boarman 1993, Kristan and Boarman 2003). Supplemental food sources such as garbage, crops, road-kills, etc., may give the raven an advantage over other less opportunistic feeders and appear to have allowed the raven population to increase precipitously in some areas. In western California portions of the Mojave Desert raven populations have increased 1500% over the last several decades consistent with urban growth in the region (Kristin and Boarman 2003). The Mojave desert includes portions of southern Nevada.

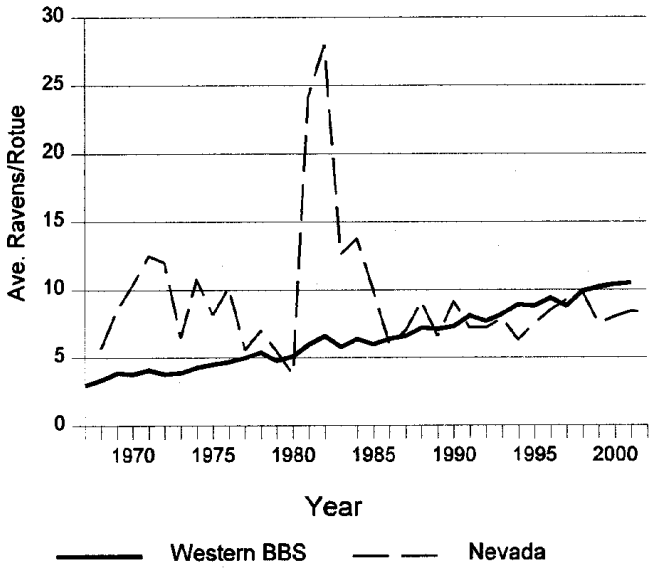

Figure 2. The average number of ravens seen per BBS route from 1966 - 2000 in the Western BBS region and Nevada (Sauer et al. 2002).

NADCP has been receiving a wide range of complaints relating to raven damage. Agriculture related complaints have included damage to livestock by pecking the eyes and other soft tissues on newborn livestock, eating livestock feed, and feeding on grains, pistachios, pecans, and other crops. Non-agricultural property damage complaints have included damage to electrical lines, power outages, fouling of satellite dishes, holes pecked in airplane wings, and golf balls stolen during tournaments. Health related complaints have included entering garbage containers and strewing trash, accumulation of fecal material on equipment used at landfills, and carrying trash from landfills to nearby residential areas. High raven numbers also represent a potential threat to nesting waterfowl, upland gamebirds, neotropical songbirds, and T&E, or other sensitive wildlife, species. The raven has been implicated as one of several causative

factors in the declines of some T&E species in the western U.S. including Western snowy plover (*Charadris alexandrinus nivosus*), California condor (*Gymnogyps californianus*), marbled murrelet (*Brachyramphus marmoratus*) and least tern (*Sterna antillarum*) (Liebzeit and George 2002, Boarman and Heinrich 1999). Because of the large number of ravens and conspicuous raven predation on juvenile tortoises, ravens have been implicated as a contributor to tortoise population decline and an impediment to tortoise recovery (Boarman 1993, United States Fish and Wildlife Service 1994, Boarman and Heinrich 1999, Kristin and Boarman 2003)

Population Estimation

The best information currently available for monitoring trends in raven populations is data from the Breeding Bird Survey (BBS). The BBS is a large-scale inventory of North American birds coordinated by the U.S. Geological Survey, Patuxent Wildlife Research Center (Sauer et al. 2004) that is comprised of a set of over 3,500 roadside survey routes primarily covering the continental United States and southern Canada. The effort was started in 1966, and routes are surveyed each June by experienced birders. The primary objective of the BBS is to generate an estimate of population change for songbirds. Populations of birds tend to fluctuate, especially locally, as a result of variable annual local habitat and climatic conditions. Therefore, statistical analyses are used to check for long-term trends in population data. Estimates of population trends from BBS data are derived primarily from route-regression analysis (Geissler and Sauer 1990) and are dependent upon a variety of assumptions (Link and Sauer 1998). The statistical significance of a trend for a given species is reflected in the calculated P-value (i.e., the probability of obtaining the observed data or more extreme data given that a hypothesis of no change is true). Data for the western BBS region show a 2.4% annual increase (average % change/year in birds per route) from 1980 through 2003 ($N = 1002$, $P < 0.01$; Sauer et al. 2004). Nevada BBS data, however, indicate a slight (-1.2%) non-significant decreasing trend during the same period ($N = 25$, $P = 0.43$; Figure 2). In the Mojave desert which includes portions of southern Nevada, populations increased rapidly (16.0% per year) during the period from 1966-1979 ($N = 8$, $P = 0.08$). Raven populations appear to be relatively stable for the period of 1980 - 2002 (-0.1%, $N = 20$, $P = 0.97$). The BBS was designed to detect large scale trends in bird populations, and the lack of significance for Nevada and Mojave desert data is not surprising given the variability of the data and the relatively low number of observations per area. Reasons for the differences in the long term population trend data between Nevada and the Western region are uncertain but may be related to the low number of BBS routes in Nevada. Location of the BBS routes in Nevada may be influential since the number of ravens observed is highest near human-related food sources (Kristin and Boarman 2003). For this reason, population trend data from the Western BBS region may provide a more accurate indication of the overall status of the raven population.

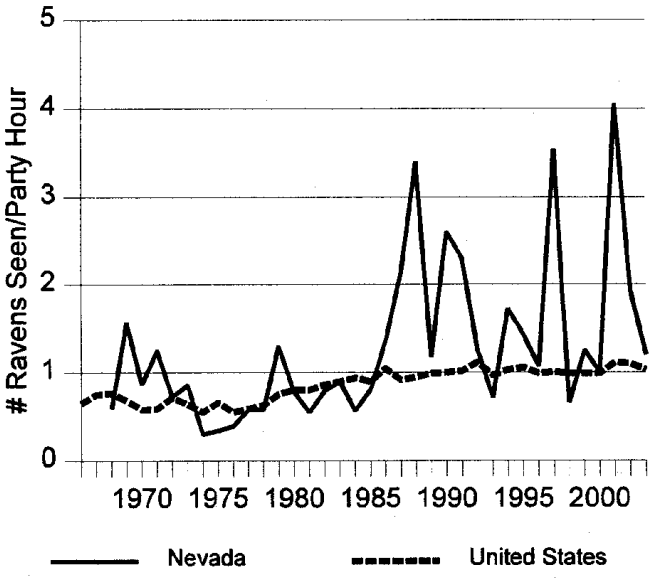

Figure 3. Number of ravens seen per party hour in NAS Christmas bird counts between 1966 and 2003.

In most areas ravens are a year-round resident, there is no evidence of migration from radio-tagged or marked populations in North America and Iceland (Boarman and Heinrich 1999), However, the species has been known to move into areas just outside its range during non-breeding season. Further, there is some question as to whether some of the birds in flocks of floaters may be migrants (Boarman and Heinrick 1999). The National Audubon Society (NAS) conducts nationwide bird surveys during the period December to early January (the NAS Christmas Counts). The Christmas Counts are likely to reflect impacts of seasonal migrants into Nevada. Unfortunately, like the BBS, the Christmas bird count data do not provide a population estimate, but they can be used as an indicator of trends in the population. NAS Christmas Count data for all States (United States) show an increase in the ravens counted annually from 1949 to 2001. During the mid-twentieth century, few Christmas counts were conducted in Nevada and by only minimal numbers of people, thus the data were highly variable (NAS 2002). Variability in CBC counts of ravens continues, but data since 1968 might indicate an increasing trend similar to that for common raven CBC data for the rest of the United States over the same period (Fig. 3).

The BBS data are intended for use in monitoring raven population trends, but it is also possible to use BBS data to develop a general estimate of the size of the raven population. Using methods adopted by Partners in Flight (PIF) to estimate population size with BBS data (Rich et al. 2003), yields an estimate of 100,991 ravens in Nevada (Table 3, M. Green, USFWS, letter to WS, December 23, 2003). The PIF system involves extrapolating the number of birds in the 50 quarter-mile circles (total area/route = 10 mi^2) from the BBS survey to the area of the bird conservation regions in Nevada. Correction factors are applied to the resulting calculations to adjust for the biology of ravens and the environment in Nevada. Correction factors include a correction for the relatively large distances that can be seen by BBS observers in Nevada. The BBS assumes a detection radius of 0.25 miles, which is increased to 0.5 miles for ravens in Nevada. The BBS surveys are conducted in the morning, but not all birds are equally visible in the morning. The PIF system applied a time-of-day correction factor of 1.3 to the raven estimate to adjust for daily patterns in raven activity. Finally, the PIF calculations apply a correction for the fact that the survey is likely to detect only one member of a breeding pair at any given time. During the nesting season, only one bird is likely to be observed because the other bird in the pair is likely to be on the nest.

Table 3. Estimation of Nevada Raven Population using BBS Data[1].

Bird Conservation Region (BCR)	Area (mi^2)[2]	BBS Avg.[3]	cv BBS Avg.[4]	Distance[5]	Pair[6]	Time[7]	Population Estimate	SE Population Estimate[8]
9	95,149	14.91	0.90	0.25	2	1.3	95,386	17,433
15	386	2.49	1.65	0.25	2	1.3	65	
16	103	23.31	0.60	0.25	2	1.3	162	
33	14,898	5.37	0.09	0.25	2	1.3	5,378	266
	110,536						100,991	

[1] Calculations provided by M. Green USFWS, December 23 letter to WS.
[2] Area of polygon (combination of BCR and jurisdiction (e.g. Nevada))
[3] Average BBS count for ravens in this combination of BCR and jurisdiction.
[4] Coefficient of variation for BBS average.
[5] Distance correction - corrects for effective detection distance of the species.
[6] Pair correction - assumes only one member of a pair is seen at any given time
[7] Time of day correction - corrects for changes in bird activity/visibility during the day
[8] Standard error of the population estimate.

Using BBS data to estimate the size of the raven population requires making some additional assumptions. The first assumption is that chosen survey routes are totally random and are fully representative of Nevada habitats. However, while routes are randomly picked throughout the State, the randomness of the selection is compromised when the survey route is subsequently assigned to the nearest available road, which can be at some distance from the randomly selected survey location. Second, it would have to be assumed that ravens are equally distributed throughout the survey area (i.e. Nevada). Therefore, if survey routes included stops at raven congregation sites with excellent food availability, such as a landfill or, if ravens generally congregate near roads to scavenge roadkill, then the data might be biased and would tend to overestimate the population. However, if the survey routes were primarily located in flat open desert areas, as is generally the case in Nevada, the population could be consistently underestimated.

In the Western US, ravens are known to scavenge along roadsides where automobile-killed animals can be found. If a BBS route is along a road that has heavy traffic and an abundance of vehicle-killed animals, more ravens would be expected to occur in the count area and, thus, the population would be overestimated. However, with the exception of a limited number of freeway and highway routes, the majority of Nevada's roads are not subject to heavy traffic and do not have an abundance of vehicle-killed animals. It would thus not be expected that the BBS counts would tend toward overestimating raven numbers due to the roadway bias. In fact, because it is not uncommon for rural Nevadans to shoot at predators spotted along roadways, ravens may well avoid roadway locations in rural Nevada locations. In a study by Kristin and Boarman (2003), proximity to roads was not a significant predictor of the number of ravens observed.

Raven nesting numbers are not precisely known over broad areas, and densities in Nevada probably vary throughout the State depending on the availability of food and water, and the presence of human disturbance (Boarman and Heinrich 1999). Within Nevada, the breeding densities of ravens are likely higher in southern and eastern Nevada, and possibly lower in some areas of western Nevada according to BBS data (Sauer et al. 2003). Knight and Call (1981) summarized a number of studies on raven territories and home ranges in the western U.S. Nesting territories ranged in size from 1 pair/3.62 mi^2 - 15.7 mi^2 in Wyoming and Oregon. In coastal California where an abundant food supply was available, raven nesting pair density was found to be 1 pair/1.7 mi^2 and 2.0 mi^2 (Linz et al. 1990, 1992). The densities in the Linz et al. (1990, 1992) studies were probably very high as a result of human food "subsidies" and were not representative of all of California. It is likely that Nevada also has sites with similar high nesting densities, although these sites are probably less common than in the more human-populated state of California. Based on nesting pair densities from studies in areas with similar BBS raven indices as Nevada (Sauer et al. 2003), the raven territorial pair density in Nevada could be estimated to be at least 1 pair/3mi^2-6 mi^2 or about 18,500 - 37,000 (median = 27,750 pairs) territorial pairs.

Information on raven mortality including age-specific mortality rates and causes of mortality is limited. Current data from the Mojave desert in California indicate 38% fledgling survival, 47% survival in the first year, 81% survival in the second year, 83% survival in the third year and 83% survival for adult birds (Webb et al. 2004). Some information on the longevity of ravens in the wild is available in banding records. The oldest known wild raven from band data was 13 years and 4 months old (Klimkiewicz 2002). However, ravens have been known to live much longer in captivity (Boarman and Heinrich 1999). Mortality factors for ravens are not well known, and probably include predation (including nest predation by other ravens), weather-related factors, disease, and human-induced mortality such as shooting.

Population Growth Model

For purposes of this analysis, the following equation was used to calculate the number of fledglings produced annually in the raven population.

$$F = (N) \times (Pb) \times (Fls),$$

where F represents the number of fledglings produced per year, N is the number of nesting pairs, Pb is the probability of nest success, and Fls is the average number of young fledged per successful nest.

The median number of territorial raven pairs (N) in Nevada estimated above is 27,750 territorial pairs in any one year. Boarman (USGS, 2004, pers. comm.) estimates that only 80% of territorial pairs will nest in a given year, which would yield an estimate of 22,200 nesting pairs in Nevada. Studies have shown a 58% to 100% nesting success rate (Pb) for ravens, with an average of 72.7% success (Boarman and Heinrich 1999). At the 72.7% average level, Nevada would have 16,139 productive nests per year. Average (± SD) clutch size reported by Boarman and Heinrich (1999) was 5.4 ± 0.42, but average fledgling success (Yf) was 2.5 ± 0.48 birds. Using the average nesting success rate (72.7%) and fledging success data (2.5) yield an estimate of 40,349 fledglings produced annually. Calculations using minimum values for nest success (58%) and fledgling success (2.5 – SD = 2.02) yield an estimate of 26,010 fledglings produced per year (Table 4). Likewise, calculations using maximum nest success (100%) and fledging success (2.98) yield an estimate of 66,156 fledglings produced per year. For purposes of a conservative analysis only estimates derived from low (26,010 = low) and average (40,349 = avg.) values will be used in subsequent discussions of population impacts.

The number of young ravens successfully fledged each year is the annual production. The annual production combined with the estimated pre-breeding population represents the post-fledgling population (Table 4). Using the estimates for low and average nesting and fledging success, post-fledging population estimates of 127,001 (low) and 141,340 (avg.) ravens, respectively, can be derived (Table 4). Assuming no immigration into the population, the estimated number of ravens produced is also the number of ravens (fledglings, sub-adults, and adults) that must either die or emigrate annually in a stable population (i.e. no growth or decline in raven density). The annual mortality (a composite of juvenile, sub-adult, and adult mortality/emigration) for ravens in Nevada, assuming a stable population, would be 24% (low) – 33% (avg.) of the post-fledging population density (Table 4).

Table 4. Estimated raven population and annual mortality for Nevada using different assumptions.

	Low Nesting and Fledging Success	Average Nesting and Fledging Success	High Nesting and Fledging Success
Pre-breeding Raven Population (Year 1)	100,991	100,991	100,991
# of Territorial Pairs	27,750	27,750	27,750
# of Nesting Pairs	22,200	22,200	22,200
Non-Breeding Birds ("floaters")	45,491	45,491	45,491
% of successful nests	58%	72.7%	100%
# Young Fledged/Successful Nest	2.02	2.5	2.98
Total Fledglings (annual production)	26,010	40,349	66,156
Total Population Post-Fledgling	127,001	141,340	167,147
STABLE POPULATION (no immigration)			
Raven Pop. Pre-Breeding (Year 2)	100,991	100,991	100,991
# of Ravens lost to mortality or emigration	26,010	40,349	66,156

	Low Nesting and Fledging Success	Average Nesting and Fledging Success	High Nesting and Fledging Success
POPULATION INCREASING 2.4% PER YEAR (no immigration)			
Raven Pop. Pre-Breeding (year 2)	103,415	103,415	103,415
# of ravens lost to mortality or emigration	23,586	37,925	63,732

Using the estimated pre-breeding raven population of 100,991, and an estimated 55,500 ravens in territorial pairs (i.e., 27,750 territorial pairs equals 55,500 birds), then 44,500 ravens would be non-breeders or "floaters." Floaters are primarily immature and non breeding birds (i.e., fledgling, 1 and 2 year old birds). Ravens do not breed until they are 3 years old, though some unsuccessful attempts to nest have been documented for 2-year old birds (Boarman and Heinrich 1999). The "floater" ravens tend to roam in loose-knit flocks that can number in the hundreds (Goodwin 1986). It is likely that these "free-floating" flocks are responsible for much of the raven-associated damage because these flocks tend to congregate at feedlots, landfills, and calving and lambing grounds where food is abundant while the breeding birds tend to remain near their territories. NADCP take, especially take associated with congregation sites such as calving grounds and landfills, would likely impact the floater segment of the raven population more than the less mobile territorial pairs. Boarman and Heinrick (1999) cite Sherman (1993) as reporting that nesting ravens in the Mojave Desert of California spent 75% of foraging time within437 yards of the nest and cites Dorm (1972) that, in many areas, breeders probably remain near their territories throughout the year.

NADCP Operations

The majority of NADCP's take of ravens has been the result of increasing requests for the protection of livestock and for the protection of natural resources (Table 1). The majority (over 96% 1999-2003) of ravens are taken by use of avicide (DRC-1339) treated egg-baits. Treated egg-baits are placed in areas where ravens have been found depredating on or harassing newborn livestock, in areas where ground nesting birds are losing eggs or young to ravens, at sites where damage to agricultural or other resources is occurring and at landfills where raven foraging and accumulation of raven feces result in a number of nuisance and health and safety problems. The methodology used by NV WS to place treated egg baits is described in Spencer (In Press)

WS had been placing eggs in raven congregation areas adjoining desert tortoise habitat to reduce the overall number of ravens likely to prey on juvenile tortoises. Recent research by Kristin and Boorman (2003) indicates that while there is a high risk of predation near large concentrations of ravens (e.g. at landfills etc.), successfully breeding raven pairs are also a substantial risk to tortoise populations. The impact of large flocks tends to be restricted to areas around the food/water source so there will be some areas that are relatively "safe" from the large flocks, but this is not the case for raven nests which are spread more uniformly across the landscape. Kristin and Boarman (2003) note that decreasing the regional raven population size or decreasing raven reproductive success in tortoise habitat may be necessary to reduce the predation risk from breeding ravens.

NADCP program activities at human-generated food and water sources generally result in a reduction in the number of ravens present This reduction is thought to be partially attributable to declines in the local population of ravens, but is also likely due to the removal of those birds with knowledge of the feeding site. Kristin and Boarman (2003) note that not all human related food and water sources are used by ravens and that ravens seem to learn about the location of food and water sources from other ravens. Birds with knowledge of feeding sites tend to lead other birds to these sites. In a study by Webb

(2001) fledgling chicks moved to human-related food sources which already had large flocks of ravens, even though similar food sources without raven activity were closer. Removing birds with historical knowledge of the feeding site may reduce the incidence of new birds being attracted to the site.

Number of Ravens Killed by NADCP

Wildlife Specialists monitor the raven numbers at baiting sites and then place an appropriate number of eggs needed to reduce the local raven numbers to the level needed to stop further damage from occurring. At the conclusion of the treatment period the WS specialist collects the unconsumed eggs and disposes of them in accordance with label directions. DRC-1339, which causes death primarily due to kidney failure, is relatively slow-acting and birds do not die at the treatment site. This makes it necessary for the attending Wildlife Specialist to estimate the number of ravens killed. Wildlife Specialists use a combination of monitoring the number of ravens at a site before and after treatment, watching ravens during treatment and monitoring the number of eggs consumed to estimate the number of ravens killed. Each of these strategies has its strengths and weaknesses. The number of birds at a site may decrease for reasons not related to the use of DRC-1339 (e.g. a roadkill carcass or spilled food attracts scavenging ravens), the amount of avicide needed for a lethal dose varies among individual ravens (each egg contains approximately 1.5 times the amount needed to kill half the birds tested (LD50), and ravens may consume or cache more than one egg. The number of egg-baits taken per raven taken varies, ranging from about 1 to 4. This analysis has identified inconsistencies in the methodology used by WS staff to determine the number of ravens killed using DRC-1339. Additional difficulties have resulted because the older data management system used by WS only allowed specialists to record the number of eggs placed. Nationwide, the WS program is implementing a new data management system and has already implemented a new system for tracking pesticide use. Nevada WS is adopting an interim policy of estimating that 1 raven is removed for 2 every eggs consumed. This system is being adopted based upon our understanding that each DRC-1339 egg contains 20 mg of DRC-1339. As stated above, this is approximately 1.5 times the oral LD50 for ravens but less than the concentration required to kill 99% of the ravens tested (LD99 - approx 32 mg of DRC-1339 per raven). This is likely an overestimate of the number of ravens taken because some eggs are occasionally consumed or carried away by non-target animals and some ravens consume or cache more than 2 eggs. An optimal system for estimating the number of ravens taken would involve using data on the number of eggs taken in combination with pre and post treatment counts of the ravens present at the site. WS is working with biologists from NWRC to develop a standardized system which uses raven observations and bait consumption to estimate the number of ravens taken. WS has implemented a pesticide tracking system which will allow specialists to record the number of baits retrieved at the end of the project, from which the number consumed by ravens can be estimated.

NADCP's estimated take of ravens has increased since the 1999 EA was written, from an estimated 2,879 birds in 2000, 4,759 birds in 2001, 5,036 birds in 2002 and decreased in 2003 to 2,475 birds. The drop in the estimated number of ravens taken between FY02 and FY03 is attributable to a variety of causes including a decline in State funding for projects to protect sensitive wildlife species from raven predation, personnel shifts which resulted in a substantial reduction in raven management projects in southern Nevada, and reduced use of raven removals at raven congregation sites (landfills) to protect desert tortoise populations. As discussed above WS has identified inconsistencies in the methods used by WS specialists to estimate the number of ravens killed with DRC-1339. These inconsistencies likely resulted in an overestimate of the number of ravens taken prior to 2003. In 2002, WS increased efforts to obtain more accurate estimates of the number of ravens taken by NADCP. Current projections of raven take for FY04 and subsequent years are approximately 2,400 ravens taken per year with a maximum of 3,000 ravens per year.

Impact on the Raven Population

The maximum cumulative raven take of 5,134 birds in 2002 (Table 5) represented only 5% of the population estimate of 100,991 and 4% of the minimum estimated post-fledging population (Table 4). Under this alternative, future NADCP annual raven take would be capped at 3,000 ravens or 3% of the raven population. Using the maximum number of known ravens taken by sources other than NADCP (Table 5) would result in a maximum cumulative take of approximately 3,210 ravens or 3% of the estimated population. For reasons noted above, population trend data from the Western BBS region is believed to provide the most accurate representation of the status of ravens in Nevada. Given a rate of population increase of 2.4% per year and a raven population estimate of 100,991, approximately 2,424 ravens are added to the Nevada population each year. Assuming that known cumulative human-caused raven mortality (Table 5) is additive to all other sources of mortality, raven take of 2,400 birds would be approximately equal to the number of birds added to the population. This would result in a stable raven population. If raven mortality is in some part compensatory to other forms of mortality (i.e. some of the ravens killed by NADCP would have died anyway from other causes) then the raven population would still be increasing, but at a rate lower than the rate for the Western BBS region (2.4%/year). If cumulative take reaches the maximum of 3,207 ravens, and all known human-caused raven mortality is additive to other sources of raven mortality, then take would exceed the number of ravens that could be removed from a stable population by approximately 810 ravens. This would be an annual decrease in the raven population of less than once percent. Given the estimated productivity of the raven population noted in Table 4 and rate of population increase of 2.4% for the Western BBS region, the raven population would likely recover within 1 year of NADCP discontinuing take. Mortality attributable to NADCP is likely at least partially compensatory to other forms of mortality. NADCP often takes ravens from flocks of "floaters" at raven congregation sites. Many of these birds are young birds without breeding territories. Data from Webb et al. (2004) indicates that first year birds have much lower survival than older birds. In other wildlife populations with high mortality rates for young non-territorial individuals, human caused mortality is often compensatory to other forms of mortality, and it seems likely that this would also be true for ravens. Eight hundred and ten birds is three percent of the lowest number of ravens lost to mortality or emigration for a stable population as estimated in Table 4. Therefore, if cumulative human-caused mortality is compensatory to even a small degree, i.e., to at least three percent of other sources of mortality, then the raven population would remain stable. If NADCP caused raven mortality is compensatory to a higher level of other raven mortality, then the population would be increasing at some level lower than the rate for the Western BBS region (2.4%/year). Given this analysis and the research and monitoring discussed below, WS concludes that this alternative will have a low to moderate impact on the raven population.

Depending upon the season, some of the ravens in Nevada may be migrants, especially some of the birds in the large winter flocks (Boarman and Heinrick 1999). Therefore, the WS take for the western U.S. (Washington, Oregon, California, Idaho, Nevada, Montana, Utah, Arizona, Wyoming, Colorado, New Mexico, and Texas) was also considered. Table 5 provides data on WS and cumulative take of ravens for the western U.S. The methods described above for estimating the number of ravens in Nevada were used to estimate that there are approximately 577,400 ravens in the western U.S. (B. Bortner USFWS, Portland, OR, letter to WS April 6, 2004) Using the 2.4% rate of population increase for the Western BBS region yields an estimate of population growth of 13,857 ravens. Even in 2002 when cumulative raven take in the western U.S. was estimated at 6451 (Table 5), cumulative raven take in the western U.S. has been lower than the estimated annual number of birds added to the raven population. Therefore, the proposed action would not result in a decrease in the raven population in the Western U.S.

Table 5. Data on WS take of Ravens in the Western U.S.

Calendar Year	2001	2002	2003
Ravens taken in Nevada by WS	4,759	5,036	2,475
Ravens taken in Nevada by other sources[1]	149	98	207
Total ravens taken in Nevada	4,908	5,134	2,682
Ravens taken in western U.S[2] by WS	5,734	6,022	4,042
Ravens Taken in Western US[2] by other sources[1]	798	429	895
Total ravens taken in Western U.S.	6,532	6,451	4,937

1 Data provided by USFWS

2 Washington, Oregon, California, Idaho, Nevada, Montana, Utah, Arizona, Wyoming, Colorado, New Mexico, and Texas

Research and Population Monitoring

NADCP, in conjunction with the NWRC, is proposing to tag and wingband ravens in southern Nevada to determine territorial patterns. The study is part of an effort to determine the relationship between ravens feeding at landfills and ravens feeding on desert tortoises. The study proposes to: 1) determine distribution and movement patterns, and nesting, foraging and roosting sites of breeding common ravens within critical desert tortoise habitat in Clark County, Nevada; 2) determine distribution and movement patterns, and nesting, foraging and roosting sites of sub-adult common ravens within critical desert tortoise habitat in Clark County, Nevada; and 3) Determine territorial status, distribution and movement patterns of common ravens using human-related food and water sources (e.g., landfills, water treatment facilities, and reservoirs/recreation areas). This study was recommended by the Clark County Multiple Species Habitat Conservation Plan and is dependent upon NADCP securing adequate funding for the project.

The National Wildlife Research Center and the U.S. Geological Survey are cooperating to develop refinements to the Partners in Flight (PIF) model used to determine raven population levels, to address concerns about some of its assumptions and to improve the precision of raven population estimates. The study is expected to be completed this summer and the results of their findings would be expected to be published in the near future.

The Great Basin Bird Observatory is working cooperatively with NDOW on a more comprehensive monitoring effort for all species of birds in Nevada. Over time, this data will enhance the species abundance estimates obtained by using BBS data and associated population estimates derived from BBS data.

As new information becomes available, NADCP will apply new findings to this analysis to determine if any changes would trigger the need for additional NEPA compliance.

Alternative 2 - No Federal NADCP PDM. Under this alternative, the amount of professional oversight in Wildlife Damage Management would diminish. PARC would likely fill in the gap left by WS. However, raven take is likely to decrease substantially as DRC-1339 is registered exclusively for use by Federal NADCP employees or individuals under their supervision. As stated above, DRC-1339 is the primary technique used by the NADCP to remove raven populations. Alternative methods (e.g. shooting) are likely to be more time consuming and expensive to implement and considerably fewer birds are likely to be taken and, based on WS experience, considerably less success would be realized in raven damage management.

Alternative 3 - Non-lethal Management Only. Non-lethal management alternatives do not always reduce predation to acceptable levels, so other government agencies, private individuals, and organizations are anticipated to assume responsibility for use of lethal control techniques. As discussed for Alternative 2, due to the lack of access to DRC-1339, the total raven take is likely to be substantially lower than with Alternative 1.

Alternative 4 - Non-lethal Required before Lethal Control. Impacts of Alternative 4 are anticipated to be the similar to Alternative 1 in that most producers have already tried non-lethal techniques prior to requesting assistance from NADCP.

Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. The availability of fiscal resources is often a limiting factor for many NADCP PDM programs. In some instances, PDM is desired but not conducted because sufficient resources are not available. Under this alternative, private and/or Federal resources to address raven depredation problems would increase. This would result in an increase in ravens taken.

WDM work is limited to the location of the particular resource being protected and, in the case of ravens, to the period of vulnerability for the resource. Therefore, although raven damage management would increase substantially, it is highly unlikely that the total area of treatment (acreage treated as a percentage of State) would substantially increase. NADCP take could conceivably increase to double current levels (approximately 6,000 ravens per year) for a period of time. However, because WDM actions are based on the level of damage experienced by the resource needing protection, once the level of damage is reduced to a tolerable level, WDM actions are halted. Therefore, any intensive level of WDM would likely not be sustained for a period of several years.

The level of raven take proposed for Alternative 5 could potentially result in a decline in raven populations. However, raven populations in some sections of Nevada are believed to be unusually high because of human-related habitat changes, and may be in excess of what would be sustained by the native ecosystem. WS believes that a decline in local raven densities would not jeopardize the viability of the raven population and could result in benefits to the ecosystem by reducing ravens to levels more consistent with natural (i.e. not human generated) resources. However, if monitoring indicated that this alternative was reducing raven populations to levels at or below those for the Western BBS region, WS would reevaluate its control program pursuant to NEPA, including agency consultations and additional public involvement. Use of the Western BBS raven data as a basis for evaluating the impacts of the NADCP program is likely conservative because, the raven population in the Western US shows an increasing trend (Sauer et al. 2003). The raven population in the Western US is believed to be benefitting from resources associated with human development and in some areas may be in excess of what would otherwise be sustained by the ecosystem, (Boarman and Heinrich 1999).

4.1.3 Mountain Lion Population Impact Analysis

Alternative 1 - Modified Current Program, the "Proposed Action" Various studies of mountain lion population dynamics provide insights into harvest levels that can be sustained by mountain lion populations. The allowable annual harvest level for mountain lion populations, determined by the USDA (1997, Revised) was 30% and was discussed further in the 1999 EA. The EA determined that 21% was likely a more a realistic allowable harvest level for Nevada. A study of mountain lions in New Mexico by Logan et al. (1996) established 11% as the sustainable harvest level for mountain lions. An impact analysis of sport harvest and depredation take is conducted in Table 6. Mountain lion take by NADCP declined from FY98 to FY01 from a high of 30 to 18. However, in FY02, NADCP was contracted to remove mountain lions from two bighorn sheep areas to increase sheep population survival and total take increased to 23 (three of which were for the protection of bighorn sheep).

Table 6. Mountain lion impact analysis of NADCP take in Nevada for FY99-FY03.

YEAR	FY99	FY00	FY01	FY02	FY03
Est. Mountain Lion	2,700	2,820	2,750	2,700	2,680
NADCP Take	28	22	18	23	29
Other Take[2]	140	130	194	104	154
Total Take	168	152	212	127	183
NADCP Take - % of pop.	1%	1%	1%	1%	1%
Other Take* - % of pop.	5%	5%	7%	4%	6%
Total Take - % of pop.	6%	6%	8%	5%	7%
Allowable Harvest	21%	21%	21%	21%	21%
Significant	No	No	No	No	No

[1] Estimates from NDOW
[2] Other take - Mountain Lions taken by sources other than NADCP (e.g., sport hunting).

Analysis of the combined mountain lion take by NADCP and sport harvest shows that the harvest percentage has been fairly stable at less than seven percent of the estimated State population. The seven percent figure is lower than the harvest level established in the 1999 EA and is also lower than even the 11% sustainable harvest level identified by Logan et al. (1996).

The Nevada mountain lion population was at near-record highs by the late 1980's, and remained high until the mid 1990's. In recent years data indicate that the lion population is stable or slightly decreasing from these historically high levels (NDOW, letter to WS, January 21, 2004). However, NDOW, has determined that there has been a sufficient population of lions to maintain their total harvest take quotas at the current level and has increased sport harvest quotas in some areas of Nevada to reduce the lion populations in specific game management units. NADCP's participation in mountain lion take may have contributed to the perceived decline in the population in recent years. However, for reasons explained in the following paragraphs, lion take by the NADCP does not have any real effect *on the quality of the human environment* with respect to the mountain lion population in Nevada, because such take would occur anyway under the current management direction and desires of the State, even in the absence of any Federal involvement (Appendix A).

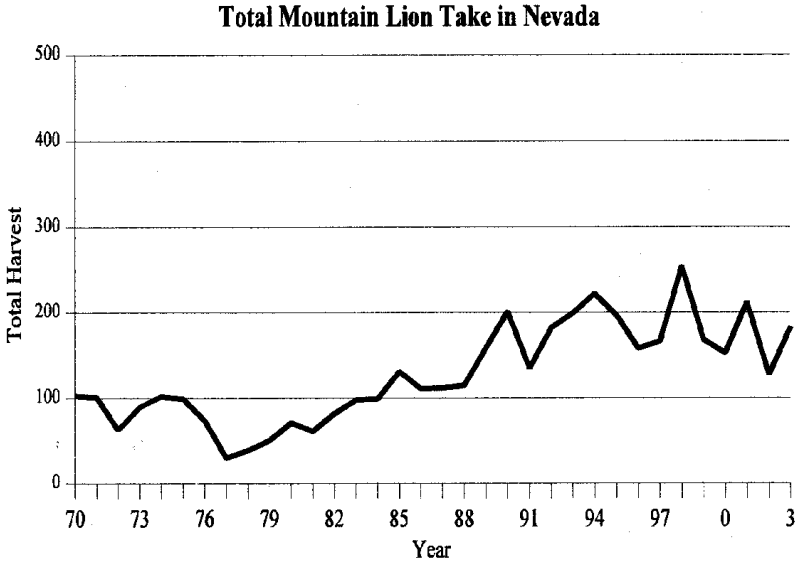

Figure 4. Annual total mountain lion harvest (sport and NADCP) in Nevada from FY70 through FY03.

One issue that is germane to the determination of "significance" under NEPA is the effect of the Federal action on the *status quo* for the environment. The States have the authority to manage populations of resident wildlife species as they see fit without oversight or control by

Federal agencies[2]. Management direction for a given species can vary among States, and State management actions are not subject to NEPA compliance or to Federal oversight. Therefore, the *status quo* for the environment with respect to State-managed wildlife species is whatever management direction that is established by the States. Federal actions that are in accordance with State management have no effect on the *status quo* (Appendix A). Also, wildlife populations are typically dynamic and can fluctuate even without harvest or control by humans. Therefore, the *status quo* for wildlife populations is fluctuation, both within and among years, which complicates determining the significance of human impact on such populations.

The Nevada Department of Wildlife has management authority over mountain lions and most other wildlife species by State law which was passed via the State's system of representative government. That system was established to represent the *collective desires* of the people of the State of Nevada with respect to the management of certain wildlife species. In this way, the State determines its desires for that component of the human environment which is comprised of resident wildlife species. The WS program recognizes and honors the right of the State of Nevada to manage resident wildlife species. WS therefore has a policy of abiding by State laws and works cooperatively with the State's wildlife management agencies to assure WS's impacts on resident wildlife species are within those parameters desired by the State.

NADCP proposes to continue to take mountain lions on a case-by-case basis on public and private lands in Nevada as long as the management authority, NDOW, requests NADCP to do so (Appendix A). NDOW (1999) has a mountain lion conflict protocol which both NDOW and NADCP follow for damage situations. NADCP expects that its lion take in Nevada will continue to be minor part of overall take allowed by NDOW. NDOW, as the agency with management authority for lions, has the authority to impose restrictions on sport harvest and depredation take if they feel such action is needed to assure cumulative take does not adversely affect the continued viability of populations. NADCP personnel provide take information to NDOW for each damage incident, and NADCP will strive to assure that its activities are in accordance with any management plan developed by NDOW. This should assure that cumulative impacts on the mountain lion population are within levels considered acceptable by NDOW.

The State's management system for mountain lions is therefore the *status quo* for mountain lion populations in the State in the absence of any Federal action by WS. Because WS only takes mountain lions as authorized by the NDOW, and because the NDOW management system allows for virtually the same impacts on mountain lion populations with or without involvement by the WS program, the WS program has virtually no adverse effect on the *status quo* for the mountain lion population in the State. Thus, a decision by WS to reduce or discontinue involvement in mountain lion management would not reduce cumulative impacts on the mountain lion population in the State (Appendix A).

Alternative 2 - No Federal NADCP PDM. Under this alternative, the amount of professional oversight in Wildlife Damage Management would diminish but would still be available to some extent through PARC. In the 1999 EA, the reduction in professional oversight is anticipated to result in a similar or slightly higher impact on target species populations over that described for Alternative 1 because the individuals conducting the work may not have the same access to training and current PDM tools and techniques as the Federal NADCP PDM specialists. The conclusions of the 1999 EA are anticipated to remain the same under current conditions.

Alternative 3 - Non-lethal Management Only. Impacts of Alternative 3 are anticipated to be the same as those described for target predator populations in the 1999 EA. Non-lethal management alternatives do not always reduce predation to acceptable levels, so other

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2 An exception is for species listed as threatened or endangered under the Endangered Species Act.

government agencies, private individuals, and organizations are anticipated to assume responsibility for use of lethal control techniques. The NADCP would not take any mountain lions but cumulative lion take may increase depending on the training and techniques available to the individuals assuming responsibility for lethal control.

Alternative 4 - Non-lethal Required before Lethal Control. Impacts of Alternative 4 are anticipated to be the same as those described for target predator populations in the 1999 EA. Impacts of the NADCP on the mountain lion population would be similar to Alternative 1 in that most NADCP cooperators have already tried non-lethal techniques prior to requesting assistance from NADCP.

Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. - Increased take of ravens would not impact take of mountain lions because the majority of ravens are taken with DRC-1339 which, when used in accordance with label directions, does not pose a risk to mountain lions. The remaining birds are taken via shooting which also does not pose a risk to non-target species. Therefore, the impacts of this alternative on mountain lion populations are identical to Alternative 1.

4.1.4 Other Predator Species Population Impact Analysis

Alternative 1 - Modified Current Program, the "Proposed Alternative." From FY99 to FY03, NADCP has taken predators other than the "primary" target predator species (e.g. coyote, mountain lion, raven), but has not exceeded a take of more than 1% of the estimated population for any of these other predator species. The average annual lethal take of these non-primary predators, including non-target take, has been 18 badgers, 10 bobcats, 10 raccoons, 8 striped skunks, 4 kit fox, 6 red fox, 3 feral dogs, and less than one each of gray fox, black bear, spotted skunk and feral cat. In FY02, an additional non-primary predator species was taken, a target ringtail. Most badgers, fox, dogs, and a few of the other species listed above were actually not targeted and were taken incidental to PDM for other species. In addition to lethal take, several projects were conducted for target badgers, bobcats, and kit fox where the animals were relocated from the damage situation. For example in FY00, 3 badgers had wandered into the city of Reno during a 2 week period, probably looking for a water source because of drought conditions, and were caught with catch poles near residences and taken out of the city and released. In FY00, 6 kit fox were removed from an air operating area at an airport and were released outside the perimeter security fence. In addition, several feral cats and dogs were caught and turned over to the appropriate animal control office. In FY00 and FY01, 10 feral cats were caught in cage traps for the protection of the Palmer's chipmunk, a species of special concern in southern Nevada, and turned over to the appropriate animal control agency.

Looking at trends in the take of these predator species by NADCP did not reveal any substantial changes because take was minimal. However, target raccoon take, though very minor, has increased recently. From FY92 to FY99, no target raccoons were taken, but in the past several years, take has increased suggesting a trend for an increase in direct control damage assistance for this species.

Impact analysis was conducted for these other species in the monitoring reports which took into consideration statewide statistics for take of furbearers. NDOW provided the sport harvest take for the three furbearer seasons. NADCP take combined with sportsman harvest did not reach substantial levels for any species with most species combined take being less than 1% of the total estimated population. The take of bobcats was the highest, reaching 5% of the estimated population because fur harvest is higher for this species than other of the other predators except coyotes. NDOW's population studies show that coyote, badger, bobcat, mink, raccoon, ringtail, spotted skunk, striped skunk, and weasel populations are stable, black bear, gray fox, kit fox, and red fox populations are increasing, and mountain lions are slightly decreasing.

Alternative 2 - No Federal NADCP PDM. Under this alternative, the amount of professional oversight in Wildlife Damage Management would diminish but would still be available to some extent through PARC. In the 1999 EA, the reduction in professional oversight was anticipated to result in an similar or slightly higher impact on target species populations over that described for Alternative 1 because the individuals conducting the work may not have the same access to training and current PDM tools and techniques as the Federal NADCP PDM specialists. The conclusions of the 1999 EA are anticipated to remain the same under current conditions.

Alternative 3 - Non-lethal Management Only. Impacts of Alternative 3 are anticipated to be the same as those described for target predator populations in the 1999 EA. Non-lethal management alternatives do not always reduce predation to acceptable levels, so other government agencies, private individuals, and organizations are anticipated to assume responsibility for use of lethal control techniques. The NADCP would not take any predators but cumulative predator take may increase depending on the training and techniques available to the individuals assuming responsibility for lethal control. However, given the extremely low level of depredation take for these species, the increase associated with this alternative is not anticipated to adversely impact predator populations.

Alternative 4 - Non-lethal Required before Lethal Control. Impacts of Alternative 4 are anticipated to be the same as those described for target predator populations in the 1999 EA. Impacts of the NADCP on predator populations would be similar to Alternative 1 in that most NADCP cooperators have already tried non-lethal techniques prior to requesting assistance from NADCP.

Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. - Increased take of ravens would not impact take of other predator populations because the majority of ravens are taken with DRC-1339 which, when used in accordance with label directions poses little to no risk to non-target species. The remaining birds are taken via shooting which also does not pose a risk to non-target species. Therefore, the impacts of this alternative on predator populations are identical to Alternative 1.

4.2 EFFECTS ON NON-TARGET SPECIES, INCLUDING T&E SPECIES

4.2.1 Alternative 1 - Modified Current Program, the "Proposed Action". The number of non-target animals taken incidentally to PDM activities and killed by NADCP in Nevada over the last 5 FYs have been approximately the same as that analyzed in the 1999 EA with the exception of the take of red fox. Non-target animals taken per year for the past five FYs have averaged 12 badgers,one bobcat, less than one black bear, less than one cat, one dog, two mule deer (*Odocoileus hemionus*), less than one gray fox, four kit fox, four red fox, less than one porcupine (*Erithizon dorsatum*), two raccoons, two striped skunks, and less than one lion.. The take of non-target animals has been minimal and intuitively has no impact on these species populations. The only potential concern is the take of red fox because one subspecies of red fox, the Sierra Nevada red fox (SNRF), is a species of management concern and is a State listed species. However, the European red fox (ERF), a nonnative species, is common in surrounding states and the red fox WS has taken have been from areas in the Eastern third of the state nearest adjoining states (i.e., Utah and Idaho) which have ERF populations. WS feels these red fox are invasive ERF and not sensitive SNRF. NDOW believes that the SNRF has been extirpated from the State (G. Tanner, NDOW pers. comm.).

SNRF were never known to exist in large numbers, but their range was thought to include much of central and western Nevada and portions of California. Their range was reported to extend from just north of Reno in southern Washoe County, across the State to southern Elko County, south to northern Clark County and then west to Esmeralda County (Hall and Kelson 1959). Much of the range information is extrapolated from relatively few confirmed SNRF data points.

Until 1997, NADCP had no record of having taken a red fox within the range of the SNRF. In fact, NADCP has no record of capturing any red fox anywhere within the State during the period of from 1975 to 1996. Prior to 1975, all species of fox were lumped together in take information generically as "fox" and it is unknown whether or not a red fox was taken. However, NADCP's taking of any fox species has always been minimal.

In FY97, two red fox were captured by NADCP personnel, one in Pershing County (freed) and the other in southern Elko County. Both of these fox were captured on the northern edge of the reported historical range of the SNRF. In FY98, another red fox was captured by NADCP in northern Elko County, but this fox was outside of the SNRF's historic range. No red fox were taken in FY99. In FY00 and FY01, four and six red fox were captured in northern Elko County, again outside of the historic range of the SNRF. In FY02, 8 red fox were taken by NADCP, one in White Pine county and seven in northern Elko County and all were outside of the area considered to be historic range for SNRF range). In addition to these fox, a den with fox pups was located in Eureka County on the eastern edge of the historic range of the SNRF, but no PDM activity was conducted on this den site and no fox were taken. In FY03, NADCP took 13 red fox.

The recent increase in red fox take, sightings and reports of fox-caused damage suggests that the red fox is becoming more plentiful in the Northeast quarter of the State. Because that area where fox numbers are showing up adjoins Idaho and/or Utah, states with expanding ERF populations, the apparent increase in red foxes is more likely a result of the spread of the introduced ERF from neighboring states rather than an emergence of a SNRF population at the outer edge of the SNRF historic range.

NADCP considers all red fox to be a non-target species except when directed by NDOW to target red fox on a case-by-case situation. NADCP is able to minimize risk to red fox through the use of underpan tension devices and the selective placement of equipment. NADCP will continue to actively avoid taking red fox until it is determined to be a problem species by NDOW.

NDOW has requested that NADCP remove limited numbers of mountain lions to improve bighorn sheep survival in some areas of Nevada. These actions are anticipated to benefit the bighorn sheep populations. NDOW's current Bighorn Sheep Management Plan (October 2001) states "Biologists with predator management expertise will evaluate possible predation on bighorn sheep release. If it is determined that predation is a limiting factor, predator management will be instituted until the population shows an increasing annual trend. If predator control does not result in an increasing annual trend, then other limiting factors will be examined. Commission Policy 25, "Wildlife Damage Management" will be followed.". Mountain lion damage management has also been initiated to protect the endangered Sierra Nevada Bighorn Sheep in California (USDI 1999).

Of primary concern are impacts to Federally listed T&E species from NADCP PDM activities. No known impacts to T&E species have occurred in the past 4 FYs except that ravens were taken for the protection of the desert tortoise. NADCP also took feral cats for the protection of the Palmer's chipmunk which is a State listed endangered species and took coyotes and ravens for the protection of the Columbian sharp-tailed grouse and sage grouse, species of management concern. The take of these predators should have a positive impact on the tortoise, chipmunk, and grouse because the Nevada management authorities for these species have identified predation as an area of concern for these populations. Listing decisions for the desert tortoise and the 1994 Desert Tortoise Recovery Plan cite raven predation as a major cause of declines in desert tortoise populations. Decreasing regional raven populations, or decreasing raven reproductive success in tortoise habitat may be necessary to reduce the predation risk from breeding ravens (Kristan and Boarman 2003).

Although, NADCP has not had any known negative effect on T&E species, NADCP consulted with the USFWS and NDOW regarding risks to these species in 2002-2003. The USFWS completed the informal consultation and Biological Opinion on the NDOW program in March

2003. The WS program is also currently engaged in a programmatic consultation on the impacts of WS actions on Federally listed T&E species. When the national consultation is completed, NADCP will incorporate all relevant Reasonable and Prudent Measures and Reasonable and Prudent Alternatives and Terms and Conditions from the National Consultation into standard operating procedures for PDM in Nevada. The T&E species listed in Nevada that were identified in the NADCP March 2003 Biological Opinion from the USFWS as being likely to be impacted by NADCP PDM activities were the bald eagle (*Haliaeetus leucocephalus*) and desert tortoise.

A new potential concern has arisen for experimental/nonessential T&E populations of California condors and gray wolves. Individual animals from these populations could wander outside of their experimental ranges into Nevada at which point the California condor would be classified as an endangered species and the gray wolf as a threatened species under the provisions of the Endangered Species Act. NADCP PDM activities could have a negative effect on these species. Potential risks to these species from NADCP PDM activities were also discussed in the March 2003 Biological Opinion from the USFWS. Information for each of these 4 species is discussed below.

Bald Eagle. Provisions for the protection of the bald eagle are similar to those established by the USFWS in the 1992 Biological Opinion for the USDA/APHIS/ADC program and are discussed in the 1999 EA and in the ADC programmatic EIS. In summary, NADCP will continue to adhere to the USDA/APHIS/WS policies for use of leghold traps and snares including not using visible bait at trap or snare sets and that trap set sites (except traps used for mountain lions) will be no closer than 30 feet from a draw station. NADCP will not shoot standard lead shot from aircraft. The NADCP is currently using steel shot for aerial hunting, but, for safety reasons, NADCP may convert to other non-lead shot. All animals shot on the ground by NADCP using lead bullets within the immediate vicinity of bald eagles will be retrieved whenever possible and/or disposed of in a manner that renders them inaccessible to eagles. NADCP will notify the appropriate USFWS office within 5 days of the finding of any dead or injured bald eagle. Cause of death, injury, or illness, if known, will be reported to USFWS. NADCP will monitor for and routinely remove carcasses or trapped animals resulting from PDM activities conducted in the immediate vicinity of active bald eagle sites to prevent attracting eagles to the immediate area of ongoing predator control activities.

Desert Tortoise. NADCP conducts predation management activities for the protection of wildlife (especially desert tortoises), livestock, and human health and safety in desert tortoise habitat. Formal consultation with the USFWS identified a remote risk that these types of NADCP actions could result in the accidental death of individual tortoises. Based on that consultation, the following reasonable and prudent measures were established to minimize the likelihood of incidental take of desert tortoises.

1. NADCP shall implement measures to minimize injury or mortality of desert tortoises by:

    a. A NADCP specialist trained to distinguish target from non-target species dens will inspect all areas proposed for application of fumigants including vehicle access routes for the presence of desert tortoises. All burrows capable of providing shelter for desert tortoises will be inspected with a fiber-optic scope, if necessary, to determine occupancy of each burrow by desert tortoises. Fumigants will not be applied to burrows that appear to be occupied by desert tortoises.

    b. A maximum speed limit of 25 mph shall be required for all vehicles on unpaved secondary roads and 15 mph on unimproved roads.

    c. Where accessible to desert tortoises, only leghold traps and foot snares with pan tension devices set for more than 4 pounds of pressure will be used. Traps not equipped with pan tension devices (e.g. pole traps) will be set no less than 6 inches above ground. Neck snares will be placed 6 or more inches from ground level or a stop will be placed on the snare so that it will not capture a desert tortoise.

d. A qualified desert tortoise biologist will be responsible for informing NADCP personnel administering PDM programs in desert tortoise habitat about desert tortoises. This will include information on the life history, legal protection for the tortoise, penalties for violations of Federal and State laws, general tortoise activity patterns, reporting requirements, measures to protect tortoises, and personal measures employees can take to promote the conservation of tortoises.

e. Fumigants shall only be used by qualified individuals in accordance with EPA label instructions.

f. The agency requesting PDM activities shall be responsible for providing a qualified desert tortoise biologist for the tortoise education project and for clearing vehicle routes of tortoises. The agency is also responsible for informing NADCP of the occurrence of tortoises in project areas.

g. NADCP staff shall check under vehicles for desert tortoises seeking temporary shelter prior to moving vehicles during the tortoise active season from March 1 through October 31.

2. NADCP shall implement measures to minimize predation on tortoises by predators drawn to carcasses or trash resulting from PDM activities by using covered raven-proof trash receptacles, removing trash from project sites, and removal and appropriate off-site disposal of retrievable animal carcasses resulting from PDM activities

3. NADCP will implement measures to minimize destruction of desert tortoise habitat such as soil compaction, erosion, or crushed vegetation due to PDM activities by restricting vehicles to existing roads or trails that have been cleared of tortoises, and by restricting overnight parking and storage of vehicles and equipment to previously disturbed areas.

4. NADCP will implement procedures to ensure compliance with the above reasonable and prudent measures, terms and conditions, reporting requirements, and consultation reinitiation requirements in the USFWS BO by submitting an annual report which includes information on the number of tortoises taken and the circumstances relating to the take, a list of all tortoises encountered or observed in project areas including exact locations and dates, the number of PDM activities abandoned due to the presence of tortoises, and recommendations for enhancing the effectiveness of the terms and conditions set forth in the BO. NADCP will also designate a field contact representative for PDM projects within desert tortoise habitat who will be responsible for overseeing compliance with the stipulations of the BO.

If the above reasonable and prudent measures are implemented, the USFWS concluded that WS take of tortoises should not exceed two tortoises annually up to a maximum of 5, cumulatively, as a result of PDM activities. If at any time take exceeds the allowable take, NADCP will reinitiate consultation with the USFWS. It was the determination of the USFWS that NADCP actions were not likely to jeopardize the continued existence of the threatened Mojave population of the desert tortoise and that no critical habitat would be destroyed or adversely modified by NADCP actions if the above reasonable and prudent measures were in place.

Gray Wolf. The gray wolf was extirpated from much of the lower 48 continental United States by the 1930's. They were reintroduced into Idaho, Montana and Wyoming as outlined in the USFWS Wolf Recovery Plan as nonessential experimental populations. Wolves outside the designated experimental population area, including those believed to have originated from the nonessential experimental population but that have wandered out of the experimental population area, retained endangered species status until April 1, 2003 when the USFWS updated its evaluation of gray wolves and designated all gray wolves in the Western Distinct Population Segment, including Nevada, as Threatened (68 FR 15803-15875). At a Nevada Wildlife Commissioners' meeting in May 2002, the Nevada Department of Wildlife stated that several fairly reliable sightings had been reported in northeast Nevada, about 200

air miles from the Idaho portion of the experimental population area. When the USFWS Wolf Recovery Coordinator, Ed Bangs, was notified of the possible sightings, he indicated a wolf from Idaho could conceivably be in northeast Nevada, but also indicated it could be a wolf-domestic dog hybrid purposefully or inadvertently released.

Several tools used in WDM such as leghold traps, snares, M-44s, and aerial hunting for large predators such as the coyote and mountain lion have the potential of taking a wolf. Standard Operating Procedures that would be used by the NADCP to minimize risks to the gray wolf include:

- Contact USFWS's Gray Wolf Recovery Coordinator to verify any APHIS-WS sightings of gray wolves in Nevada.

- APHIS-WS will not use M-44s and neck snares in the immediate area of "occupied endangered gray wolf range" in accordance with the 1992 BO on the Wildlife Services National program. Occupied gray wolf range is defined by the 1992 BO is 1) an area in which gray wolf presence has been confirmed by State or Federal biologists through interagency wolf monitoring programs, and the Fish and Wildlife Service has concurred with the conclusion of wolf presence, or 2) an area from which multiple reports judged likely to be valid by the Fish and Wildlife Service have been received, but adequate interagency surveys have not yet been conducted to confirm presence or absence of wolves.

- NADCP will require that all leghold traps and leghold snares be checked at least once a day in areas known to be occupied by gray wolves. Use of electronic monitoring of traps or snares for daily checks may be used in monitoring traps and/or snares.

- NADCP will require that aerial hunting and shooting in areas where gray wolves have been documented will be limited to those personnel who can distinguish coyotes from wolves.

- All NV WS employees attended a basic wolf identificationtraining course taught by C. Nemyer, USFWS in 2003.

- NADCP will abide by all applicable reasonable and prudent alternatives, measures, and terms and conditions required as a result of findings in any ESA consultations between APHIS-WS and FWS.

- NADCP may assist the Wolf Recovery Team in trapping wolves so that they can be examined. The use of immobilizing drugs to capture a wolf will only be conducted by NADCP personnel certified in their use.

In the event that a wolf has been found to kill livestock in Nevada, NADCP will verify and document the predation, obtain pertinent evidence such as photographs, and contact the USFWS Wolf Recovery Team. Should the Recovery Team determine that the offending individual(s) must be removed, it is likely that NADCP would be asked by the Recovery Team to initiate WDM activities to control the damages caused by the offending wolf or wolves.

NADCP received concurrence from the USFWS on March 27, 2003 that the proposed program would not be likely to adversely affect gray wolves.

California Condor. Some concern has arisen about the potential of PDM to affect wandering condors from the reintroduced experimental/nonessential population along the Colorado River in Arizona that venture out of the projected range into Nevada. The designated experimental range of the condors includes areas in Nevada and Utah. Reports indicate that several of these condors have temporarily migrated outside of their experimental population zone, which

changes their status to endangered while they are out of the experimental population area. To our knowledge, no condor has ventured outside of the boundaries of the experimental range into Nevada. However, the potential exists for one to wander into southern Nevada beyond the experimental range where its status would change.

The California condor is strictly a scavenger, eating carrion such as cattle, sheep, deer, and ground squirrel carcasses. The condor finds carrion by sight and not smell, unlike a turkey vulture which relies as much, or more, on odor to locate dead animals as it does sight. WDM tools that may affect California condors include primarily the M-44, leghold traps, strychnine for rodent control, and lead poisoning from ingesting lead pellets/bullets from carcasses of predators taken by shooting.

Through consultation with the USFWS, the following measures were established for the protection of California Condors in Nevada. NADCP will continue to adhere to the USDA/APHIS/WS policies for use of leghold traps and snares including not using visible bait at the set site and that trap set sites (except traps used for mountain lions) will be no closer than 30 feet from a draw station. Additionally, in Clark County, South and East of I-15, the only area of NV in the experimental population area for California condors, WS will not use double leghold sets (more than 1 trap within 20 ft of one another) for coyotes or other large predators. NADCP will not use strychnine bait (not used in PDM but below ground for pocket gopher control) in Clark County, South and East of I-15. NADCP will not shoot standard lead shot from aircraft. The NADCP is currently using steel shot for aerial hunting, but, for safety reasons, NADCP may convert to non-lead shot. In Clark County, all animals shot on the ground by NADCP using lead bullets will be retrieved whenever possible and/or disposed of in a manner that renders them inaccessible to condors. NADCP will not use M-44s South and East of I-15. If a Condor sighting is confirmed within Nevada North and West of I-15, M-44 sets will be recessed, covered or placed in single sets (not closer than 1000 feet from one another. The California Condor Recovery Coordinator with USFWS in Ventura, California will contact NADCP should a condor be found in Nevada. NADCP will contact the Coordinator on annual basis to make sure that the Coordinator knows contact points in Nevada should a condor be seen. In addition, this will ensure that changes in personnel and phone numbers are exchanged.

Finally, other potential effects to non-targets noted in the EA (NADCP 1999) included effects on wildlife from aerial hunting. During the last three FYs, no impacts were noted to other wildlife including wild horses from aerial hunting and other NADCP PDM activities.

4.2.2 Alternative 2 - No Federal NADCP PDM. Under this alternative, the NADCP would be unable to provide assistance with predation management including programs to protect T&E species. The amount of professional oversight in PDM would diminish but would still be available to some extent through PARC. In the 1999 EA, the reduction in professional oversight was anticipated to result in an increase in impacts on non-target species populations over that described for Alternative 1 because the individuals conducting the work may not have the same access to training and current PDM tools and techniques as the Federal NADCP PDM specialists. This Alternative would also result in less aerial hunting and increased ground work for predation management. The increase in ground work would result in increases in potential risks to non-target animals from an increased use of traps and snares (Wagner and Conover 1999). This alternative would not include the use of DRC-1339 to take ravens, so shooting would presumably increase. The conclusions of the 1999 EA are anticipated to remain the same under current conditions and the anticipated increase in non-target take is not anticipated to adversely impact non-target species populations..

4.2.3 Alternative 3 - Non-lethal Management Only. Impacts of Alternative 3 are anticipated to be the same as those described for non-target species populations in the 1999 EA. Non-lethal management alternatives do not always reduce predation to acceptable levels, so other government agencies, private individuals, and organizations are anticipated to assume responsibility for use of lethal control techniques. The NADCP would not take any predators but cumulative non-target species take may increase depending on the training and techniques

available to the individuals assuming responsibility for lethal control. However, given the extremely low level of non-target take for these species, the increase associated with this alternative is not anticipated to adversely impact predator populations. Because non-lethal alternatives are not always as effective as a fully integrated damage management program, NADCP would be less effective in reducing predation on wildlife. Consequentially, predation on wildlife species, including T&E species is likely to be higher than if Alternative 1 were selected.

4.2.4 Alternative 4 - Non-lethal Required before Lethal Control. Impacts of Alternative 4 are anticipated to be the same as those described for target predator populations in the 1999 EA. Impacts of the NADCP on predator populations would be similar to Alternative 1 in that most NADCP cooperators have already tried non-lethal techniques prior to requesting assistance from NADCP. Because non-lethal alternatives are not always as effective as a fully integrated damage management program, there could be a delay in providing effective predation management for the protection of T&E species and other wildlife species while non-lethal methods are attempted. Consequentially, predation on wildlife species, including T&E species could be higher than if Alternative 1 were selected.

4.2.5 Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. - Because of the low risk to non-target species from the primary methods used to capture ravens (DRC-1339 and shooting), NADCP take of non-target species is likely to be similar to that described for Alternative 1. However, because some of the programs likely to benefit from increased funding are programs to protect T&E species from depredation by ravens, this alternative could have a greater beneficial impact on non-target species than Alternative 1.

4.3 HUMANENESS

4.3.1 Alternatives 1 - 4. NADCP personnel are professional and continued to conduct PDM with humaneness in mind. In addition, technical assistance on non-lethal methods has been given to cooperators throughout the last three FYs. The analysis in the 1999 EA for these alternatives remains valid. No new issues have arisen in this area.

4.3.2 Alternative 5. Under this alternative, NADCP personnel would continue to act in a professional and responsible manner with humaneness in mind. Efforts to maintain and improve the selectivity and humaneness of PDM activities described in the 1999 EA would continue to be used. However, because this alternative would result in the increased take of ravens, some individuals may perceive this alternative as being less humane than Alternatives 2-4 and slightly less humane than Alternative 1. Conversely, it may also be argued that increased raven control would result in decreases in pain and suffering caused by maiming of livestock and predation on wildlife.

4.4 EFFECTS ON RECREATION

4.4.1 Alternative 1 - Modified Current Program, the "Proposed Action." NADCP contracts averaged 13 million acres of Bureau of Land Management (BLM) and U.S. Forest Service (USFS) lands in FY99-FY02 representing an average of 80% of the lands NADCP worked in Nevada. (Actual acres worked is much less than the number of acres under contract.) The BLM and USFS lands worked by NADCP are not often frequented by recreationists because these areas are primarily livestock allotments. At the same time, NADCP worked on only an average of 3.3 million acres of other lands (private, military, Indian, State and other Federal) in FY99-02. However, the majority of animals taken by the NADCP in FY99-FY02 (59%) were taken from these other lands. Table 7 gives the take for FY99-FY02 from BLM and USFS lands. The increase in number of ravens taken reflects the increase of PDM for ravens in Nevada.

Table 7. Predators taken by NADCP on BLM and USFS Lands in Nevada for FY99-FY03.

Species	FY99	FY00	FY01	FY02	FY03	AVERAGE
Badger	5	10	1	6	13	7
Bobcat	4	11	5	11	5	7
Coyote	2,371	3,063	2,411	2,256	2,217	2,464
Gray/Kit Fox	3	-	-	6	2	2
Lion	17	13	15	18	27	18
Raven	110	864	1,717	786	730	838
Total	2,510	3,961	4,149	3,083	2,994	3,426

The take of animals on BLM and USFS lands is minimal averaging about one target predator for every six square miles of land under BLM or FS agreement for PDM which would have little impact on recreation. Although the primary reason for the take of these animals is for predation management, such take also indirectly offers benefits to recreationists because blood samples from many of the mammalian predators are analyzed for plague titers. This information has allowed the Health Department to warn recreationists such as campers about plague "hot spots" in certain areas of Nevada by posting signs.

During FY00, a number of environmental and animal protection organizations expressed their concern regarding the effects of WS's low level aerial hunting flights on non-target wildlife and on public land recreational users to BLM in Colorado. The 1999 EA addressed these issues for Nevada in sections 4.2.1.2 and 4.2.1.4. NADCP has agreements for conducting PDM on no more than about 25% of the lands in Nevada and much less for aerial hunting. NADCP conducts PDM on a fraction of the land under agreement, so the actual land affected by NADCP PDM activities is much less than 25% of the lands in Nevada. In FY01 NADCP aerial hunted 17% of the lands in Nevada. Eighty percent of the area receiving aerial hunting was BLM lands, 15% private lands, 1% USFS lands, and 4% other lands. NADCP concentrates flying efforts during certain times of the year to specific areas such as lambing grounds so the amount of time spent flying over properties under agreement is relatively small on an annual basis. For the 17% of the State over which WS aerial hunting activities occurred in FY01, the amount of time spent was 9 min/mi^2 flying for private lands, 7 min/mi^2 for USFS lands, 2 min/mi^2 for BLM lands, and 6 min/mi^2 for other lands in FY98. This increased to 19 min/mi^2 flying for private and USFS lands, 3 min/mi^2 for BLM lands, and 4 min/mi^2 for other lands in FY01. This analysis shows that about 83% of the land area of the State had no WS aerial hunting activity and that the frequency and duration of aerial hunting on the 17% of the State over which such activity was conducted was minimal. The 1999 EA concluded that effects on recreational users of public lands were insignificant, and this analysis shows that the potential for such effects continues to be low.

4.4.2 Alternative 2 - No Federal NADCP PDM. The analysis in the 1999 EA remains valid. Under this alternative, there would be no NADCP involvement in predation management and, consequentially, no impact on recreation. However, PARC would probably provide some level of predation management on public lands. Private efforts to reduce or prevent depredations on livestock allotments would likely increase which could result in less experienced persons implementing PDM methods and a greater impact on recreation than Alternative 1. Aerial hunting would probably be greatly reduced under this alternative because it requires pilots with experience at low level flying and a permit from NDOW. Even if NDOW increased permits, impacts are not likely to be greater than analyzed for Alternative 1. A reduction in aerial hunting would result in an increase in the amount of ground traffic and hours of PDM required for an equivalent level of predation management (Wagner and Conover 1999). This increase in PDM activity on the ground would increase the risk of damage to the environment from vehicular traffic and increase the likelihood of a conflict between PDM and recreational activities.

4.4.3 Alternative 3 - Non-lethal Management Only. Impacts of Alternative 3 are anticipated to be the same as those described in the 1999 EA. NADCP activities are

unlikely to have much impact on hunting and nonconsumptive recreational activities, with the possible exception that in some cases additional hours of labor may be required to achieve levels of predation reduction that could be achieved with Alternative 1. Some non-lethal methods can pose conflicts with recreational users; for example guard dogs have been known to show aggressive behavior toward hikers; the noise and flashing lights of the Electronic Guard could disturb recreationists seeking solitude or trying to sleep while camping; and predator-proof fences might be viewed as hindrances to human and wildlife movement. Therefore, this alternative might actually result in more adverse effects to recreationists than Alternative 1. However, as under Alternative 2, there is likely to be an increase in private predation management efforts, so there may be an increase in impacts on hunting and nonconsumptive uses similar to Alternative 2.

4.4.4 Alternative 4 - Non-lethal Required before Lethal Control. Impacts of Alternative 4 are anticipated to be the same as those described in the 1999 EA. Impacts of the NADCP on recreation would be similar to Alternative 1 in that most NADCP cooperators have already tried non-lethal techniques prior to requesting assistance from NADCP. Because non-lethal alternatives are not always effective as a fully integrated damage management program, some individuals may seek alternative sources of PDM. Impact on PDM from these alternative sources will vary depending on the methods selected and the training of the individual conduction the PDM and have been described for Alternatives 2 and 3. Potential conflicts of some non-lethal methods with recreationists would likely be greater under this alternative than Alternatives 1 and 2, but probably less than Alternative 3.

4.4.5 Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. This alternative would result in an increase in NADCP raven management activities. A portion of this work is conducted on public lands. Although DRC-1339 and shooting, when used properly, pose relatively little risk to non-target species and recreationists, there would be a slight increase in potential to impact recreation over that described in Alternative 1.

4.5. IMPACTS ON PUBLIC SAFETY

4.5.1 Alternative 1 - Modified Current Program, the "Proposed Action."

Pesticide Use: NADCP used several PDM methods that have inherent human safety risks associated with them during FY99-FY02. During this time, an average of 172 M-44 capsules per year were fired. There were no injuries or illnesses to people from the use of M-44s in Nevada. Finally, Wildlife Specialists certified to use immobilization/euthanasia drugs did use ketamine/xylizine and Beuthanasia-D® to take several predators, but did so in a safe manner that did not jeopardize public safety. No other chemicals were used in FY99-FY02 for PDM. The amount of chemicals, with the exception of DRC-1339 treated eggs, has basically remained the same as that analyzed in the EA (NADCP 1999) which was found to have negligible effect on the environment, including human safety.

In FY01 and FY02, two "Special Local Need" (per Section 24c of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)) (SLN) labels for use of DRC-1339 to control raven damage were approved by NDOA. The new labels allow NADCP to respond to requests to control raven damage at landfills, nut orchards, and power equipment and other structures. Label changes for wildlife and threatened and endangered species also allowed NADCP to use DRC-1339 to respond to request from NDOW to manage raven predation. In FY00, several landfills contacted NADCP to assist them with problem ravens at landfills because Health Departments had cited them for violations of health codes associated with ravens carrying contaminated materials from landfills and depositing it in the surrounding community (R. Beach pers. comm.). Alfalfa seed producers have been experiencing an ongoing problem involving ravens damaging their leaf-cutter bee boards. One grower contacted NADCP because he had suffered over $1,000 damage to the ravens in FY00. Leaf-cutter bees are purchased by

the farmer and placed in the field to help pollinate the alfalfa crop. The bee boards which resemble thick peg boards, are used as homes for the bees. The ravens eat the bees as well as pick out the larva and honey from the boards. Fruit and nut orchards in southern Nevada have also been sites where ravens have caused substantial damage in FY00. Therefore, NDOA's Pesticide Division provided NADCP with a letter stating that it was their determination that Section 2 (ee) of FIFRA allowed for these new resources to be protected using DRC-1339 treated baits (including new bait substrate materials) to remove depredating ravens at staging sites surrounding these resources. It is anticipated that the expanded use of DRC-1339 will still have the minimal effect on the environment as was discussed thoroughly in the 1999 EA.

Wildlife Threats to Human Health and Safety: During FY01, one person was bitten by a coyote. During FY00, 1 person was bitten by a kit fox. And during FY99, 13 people, all adults, were bitten by coyotes. In response, approximately 30 coyotes and the kit fox were taken in the areas where people were bitten. None of the animals taken tested positive for rabies, but several people underwent the rabies treatment. The apparent reason for the behavior of these animals was determined to be that the coyotes and fox were hand fed by people and lost their fear of humans. Several PDM methods were used to take the coyotes in these areas including tranquilizer dart pistols which demonstrates the closeness that people can get to them.

During FY99-FY03, NADCP assisted the Washoe County and State Health Departments with monitoring plague and West Nile virus as discussed in the need for action. Fortunately, the percent positive of predators carrying plague titers has dropped to about10% in FY02 from a high of over 20% in FY99.

West Nile virus was discovered in Nevada on July 15th, 2004, in Carson City, when a sick crow was picked up by health officials and tested positive for the virus. This is the first confirmed case of West Nile virus in Nevada (pers. Comm. Dr. Rink, NDOA, Disease Lab, 2004). NADCP will continue to cooperate in providing samples and will monitor the spread of West Nile virus.

During FY 99, round worms (*Baylisascaris procyonis*) were confirmed in raccoon feces by the Washoe County Health Department . When accidentally ingested by humans and other animals via hand contact with soil or water contaminated with raccoon feces, the roundworms hatch in the intestine and travel through the organs and muscles. Swallowing a few eggs may cause few or no symptoms. Swallowing a large number of eggs may lead to serious symptoms including death. There is no effective, curative treatment for *Baylisascaris* infections, but early treatment may reduce the extent of damage (CDC 2002). The presence of this parasite is of major concern because raccoons have become abundant in the Reno area. NADCP loaned out 540 cage traps in FY 03 to the general public so that they could catch and remove nuisance raccoons from their property. The Health Department confirmed the roundworm in another Reno area raccoon in FY02. Removal of raccoons carrying Baylisascaris via the use of cage traps and euthanasia would be a benefit to human health and safety.

Risks Associated with Aerial Hunting: Two new issues were raised by the public in Colorado concerning the potential for aircraft accidents by WS aerial hunting operations to cause catastrophic ground fires or pollution as a result of spilled fuel and oil and are addressed here. As a result of these issues, the following information was obtained from Mr. Norm Wiemeyer, Chief, Denver Field Office of the National Transportation Safety Board (the agency that investigates aviation accidents):

Regarding major ground or forest fires, Mr. Niemeyer stated he had no recollection of any major fires caused by government aircraft since he has been in his position beginning in 1987. Also, an informal polling of WS State Directors in the Western Region affirms that no major ground fires have resulted from any WS aviation accidents.

Regarding fuel spills and the potential for environmental hazard from aviation accidents, Mr. Wiemeyer stated that aviation fuel is extremely volatile and will evaporate within a few hours or less to the point that even its odor cannot be detected. Thus, there should be no environmental hazard from unignited fuel spills. The quantities involved in WS aircraft accidents are small (10 - 30 gallons). In some cases, not all of the fuel is spilled.

Regarding oil and other fluid spills -- the aircraft owner or his/her insurance company is responsible for cleanup of spilled oils and other fluids if required by the owner or manager of the property on which the accident occurred. In the case of BLM, Forest Service, and National Park Service lands, the land managing agency generally requires that contaminated soil be removed and disposed of. In most accidents involving private property, the property owner is generally not concerned about the quantities of spilled oil involved in these types of accidents and has not requested or required clean-up. With the size of aircraft used by Wildlife Services, the quantities of oil capable of being spilled in any accident are small and insignificant with respect to the potential for environmental damage - 6-8 quarts maximum for reciprocating (piston) engines and 3-5 quarts for turbine engines. Aircraft used by WS are single engine models, so the greatest potential amount of oil that could be spilled in one accident would be about 8 quarts.

Petroleum products biodegrade through volatilization and bacterial action, particularly when exposed to oxygen (EPA 2000). Thus, small quantity oil spills on surface soils can be expected to biodegrade readily. Even in subsurface contamination situations involving underground storage facilities which would generally be expected to involve larger quantities than would ever be involved in a small aircraft accident, EPA guidelines provide for "natural attenuation" or volatilization and biodegradation in some situations to mitigate environmental hazards (EPA 2000). Thus, even where oil spills in small aircraft accidents are not cleaned up, the oil does not persist in the environment. Also, WS accidents occur in remote areas away from human habitation and drinking water supplies. Thus, the risk to drinking water appears to be exceedingly low or nonexistent.

For these reasons, the risk of ground fires or fuel/oil pollution from aviation accidents is considered to be low. Based on the history and experience of the program in aircraft accidents, it appears the risk of significant environmental damage from such accidents is exceedingly low.

4.5.2 Alternative 2 - No Federal NADCP PDM. Under this alternative, there would be no NADCP involvement in predation management and, consequentially, there would not be any risks to human health and safety from NADCP pesticide or aircraft use. Conversely, NADCP would not be available to provide assistance with wildlife threats to human health and safety. However, PARC would probably provide some level of assistance with these issues. Private efforts to reduce or prevent depredations on livestock allotments would likely increase which could result in less experienced persons implementing PDM methods and a greater health and safety risks associated with improper use of PDM tools. Aerial hunting would probably be greatly reduced under this alternative because it requires pilots with experience at low level flying and a permit from NDOW. Even if NDOW increased permits, impacts on public safety are not likely to be greater than analyzed for Alternative 1. The reduction in aerial hunting would result in further increases in use of ground-based PDM techniques (Wagner and Conover 1999). As stated above, increased ground-based private efforts to reduce or prevent depredations on livestock allotments could result in less experienced persons implementing PDM methods and a greater health and safety risks associated with improper use of PDM tools.

4.5.3 Alternative 3 - Non-lethal Management Only. Impacts of Alternative 3 are anticipated to be the same as those described in the 1999 EA. Most techniques with the potential for negative impacts on the physical environment and human health and safety (e.g. aerial hunting, pesticides, traps, etc.) would not be used under this alternative. Non-lethal tools are not suitable for all situations, so NADCP efficacy in predator

management for human health and safety would be reduced. However, PARC would probably provide some level of assistance with these issues. Private efforts to reduce or prevent depredations on livestock allotments would likely increase which could result in less experienced persons implementing PDM methods and greater health and safety risks associated with improper use of PDM tools. Some non-lethal methods can pose risks to the public; for example guard dogs have been known to show aggressive behavior toward hikers. As with Alternative 2, aerial hunting would probably be greatly reduced under this alternative because it requires pilots with experience at low level flying and a permit from NDOW. Even if NDOW increased permits, impacts are not likely to be greater than analyzed for Alternative 1. The reduction in aerial hunting would result in an increase in the amount of ground traffic and hours of PDM required for an equivalent level of predation management (Wagner and Conover 1999). This increase in PDM activity on the ground would increase the risk of damage to the environment from vehicular traffic and increase the likelihood of a conflict between PDM and recreational activities.

4.5.4 Alternative 4 - Non-lethal Required before Lethal Control. Impacts of Alternative 4 are anticipated to be the same as those described in the 1999 EA. Impacts of the NADCP on public safety and the environment would be similar to Alternative 1 in that most NADCP cooperators have already tried non-lethal techniques prior to requesting assistance from NADCP. Because non-lethal alternatives are not always effective as a fully integrated damage management program, some individuals may seek alternative sources of PDM. Impact on PDM from these alternative sources will vary depending on the methods selected and the training of the individual conducting the PDM and have been described for Alternatives 2 and 3. However, the impacts on public safety and the environment are likely to be less than for Alternatives 2 and 3 and more than for Alternative 1.

4.5.5 Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. This alternative would result in an increase in NADCP raven management activities. Under this alternative there would be an increase in use of DRC-1339 and shooting to remove ravens. However, when used properly, these methods pose relatively little risk to public safety and the environment so negative impacts associated with this alternative would be similar to those described for Alternative 1. Some raven removals will be conducted at landfills and other sites where raven activities pose a risk to public health. Improved raven management at these sites would be a benefit to public health.

4.6 EFFECTIVENESS OF NADCP

The effectiveness of the program alternatives is included as an issue for consideration in this EA amendment, not because it is an environmental issue as defined by NEPA, but because it is a management issue which a decision maker can consider along with the environmental issues. In addition to being a NEPA compliance vehicle for informed decision making, environmental assessments can also be important communication and planning tools. WS often includes issues that may not be required under NEPA (e.g. humaneness) but are important issues to the general public, as well as agencies or service recipients. The issue of effectiveness is important to service recipients, and to WS as a service provider. Effectiveness in this case, is considered to compare the relative merits of each alternative which would allow NADCP to provide service and improve the chances of successfully resolving damages. Because one of the program's goals is to stop, prevent, or minimize damage, a quantitative analysis is not always possible. It is difficult to measure damage that did not occur. We attempt simply to weigh the relative potential for effectively stopping, preventing, or minimizing damage among the alternatives.

During FY99-FY01, NADCP assisted an average of 1,600 persons or entities per year with technical assistance and 590 people with direct control projects. Customer satisfaction was believed to be satisfactory as minimal complaints were received. In a 1999 National Agricultural Statistic Survey (NASS) survey of livestock producers that received assistance from WS, 85 percent of producers in mountain and western states rated their satisfaction with the assitance

they received from WS as moderate to high (very satisfied). No new concerns arose in this issue between FY99 and FY02. The assessment of the effectiveness of the NADCP under Alternatives 2 and 3 has not changed since the 1999 EA and will not be addressed in this document.

4.6.1. Alternative 1 - Modified Current Program, the "Proposed Action." Recently approved SLN labels for DRC-1339 (discussed in Sections 3.1 and 4.5.1) allow NADCP to respond more effectively to requests to assist landfill managers, nut orchard operators, and power companies with power poles that are threatened with raven damage problems. Prior to the availability of the new SLN labels, NADCP was unable to assist with raven control with this method for these resources. Label changes for wildlife and threatened and endangered species also allowed NADCP to use DRC-1339 to respond to request from NDOW to manage raven predation. Because this alternative provides an effective tool which was previously unavailable for these circumstances, this alternative is considered more effective than the proposed action was in the 1999 EA. Damage management efforts for all other species would not change

4.6.2 Alternative 4 - Non-lethal Required before Lethal Control. As the SLN labels provide for a more effective raven damage management program under the Proposed Action Alternative, so would the labels allow NADCP to provide more effective service under this alternative, but only after non-lethal methods were used. Since service recipients usually use non-lethal methods if they are considered to be beneficial, the effectiveness of this alternative would not substantially differ from the proposed action in those cases. In some cases where immediate lethal methods are needed to stop damages, this alternative would be less efficient. Overall, this alternative would probably not be as effective as Alternative 1, the proposed program for raven damage management. Damage management efforts for all other species would not change

4.6.3 Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. Similar to Alternative 1, the Proposed Action, damage management efforts for all other species would not change, but there would be additional ability to respond to raven damage with DRC-1339, as discussed above under Section 4.6.1. Additional revenue provided under this alternative would release the financial limitations on NADCP's ability to address raven damage. Consequentially, this alternative would be more effective than all other alternatives in addressing raven damage and have the same efficacy for all other species as Alternative 1.

4.7 IMPACTS ON SPECIAL MANAGEMENT AREAS (SMAS)

From FY99-FY01, NADCP worked on at most three BLM Wilderness Study Areas (WSAs) per year and either coyotes or mountain lions were targeted in these areas. NADCP worked on at most two USFS wilderness areas per year and only mountain lions were targeted in these areas for the protection of livestock. NADCP did not conduct PDM on any other special management areas in FY99-FY01. Because of the relatively low amount of work on special management areas and because NADCP coordinates all planning with Federal land managers for conformance to land use plans, NADCP has no impact on SMAs. The analysis of the impacts of Alternatives 1-4 on Special Management Areas in the 1999 EA remains valid and will not be discussed in this amendment.

4.7.1 Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. Under this alternative, raven damage management may increase on tortoise management zones. All raven damage management work in these areas would be closely coordinated with land managers to fully conform with tortoise management area land use plans, including restrictions to avoid or minimize harm to tortoises and their habitat.

4.8 INDIRECT AND CUMULATIVE IMPACTS

NADCP had no known direct or indirect impacts to any resources or people other than the positive contributions to local economies as discussed in the EA and under issue 9 in FY99-FY02. The evaluation of the Indirect and Cumulative Impacts associated with Alternatives 1-4 in the 1999 EA remains valid and will not be addressed in this amendment.

4.8.1 Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. This alternative would result in an increase in NADCP raven management activities. Under this alternative there would be an increase in use of DRC-1339 and shooting to remove ravens. However, when used properly, these methods pose relatively little risk to public safety and the environment so negative impacts associated with this alternative would be similar to those described for Alternative 1. Some raven removals will be conducted at landfills and other sites where raven activities pose a risk to public health. Improved raven management at these sites would be a benefit to public health.

4.9 COST EFFECTIVENESS

The cost effectiveness of NADCP was discussed in the 1999 EA and in the Record of Decision for the 1999 EA. It is still concluded that NADCP is being as cost effective as possible. The FY99-FY01 monitoring reports concluded that PDM saved between 3.6 to 6.0 million dollars of livestock and that the value of livestock saved was 3-5 times the cost of providing the service. . The value of T&E species saved or from reduced risks to human health and safety have not been quantified, but add to the benefits of WS PDM to an unknown degree. Bodenchuk, et al. (2001) determined predation management shows benefit:cost ratios of between 3:1 to 27:1 for agriculture and 2:1 to 22:1 for wildlife protection. The cost of NADCP PDM services to protect livestock (sheep, lamb, calf) in Nevada included salary and benefits for field, supervisory and administrative staff, supplies, equipment, vehicles and transportation, aerial hunting, and all other related program expenditures. As discussed in the 1999 EA, cost effectiveness is not, nor should it be, the primary goal of the APHIS-WS program. Additional constraints, such as environmental protection, land management goals, and others, are considered whenever a request for assistance is received. These constraints increase the cost of the program while not necessarily increasing its effectiveness, yet they are a vital part of the APHIS ADC program.

4.9.1 Alternative 5 - Integrated Predator Damage Management with Intensive Raven Damage Management. This alternative would increase the amount of PDM conducted by NADCP, but would not result in any changes in the way NADCP conducts PDM. Costs would be expected to increase but so would benefits. Therefore, cost effectiveness for this alternative is anticipated to be similar to that described for Alternative 1. Therefore, it is concluded that this would be a cost-effective alternative for predation management.

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APPENDIX A

LETTER FROM THE NEVADA DIVISION OF WILDLIFE

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Assessment of Impact to Mountain Lions in Nevada by USDA-APHIS-Wildlife Services

The Nevada Board of Wildlife Commissioners and the Nevada Department of Wildlife (NDOW) were given management authority over mountain lions and most other wildlife species by Nevada State law (Nevada Revised Statute (NRS) 501.100, 501.181, 501.331) which was passed via the State's system of representative government. Under this authority the Board of Wildlife Commissioners and NDOW are charged with the management of the mountain lion. A diversity of human values and biological facts help guide these entities to a management strategy that preserves the lion as a contributing member of the fauna of the state of Nevada, but also recognizes public safety issues, economic factors, and recreation values.

NDOW is responsible by state statute (NRS 503.595) for controlling wildlife causing damage to personal property or endangering personal safety. A protocol established by NDOW and approved by the Board of Wildlife Commissioners sets forth policies and procedures to be followed in controlling and preventing lion damage and addressing public safety issues. In carrying out these policies where mountain lion/ human interactions are involved, the NDOW has the discretion to chose the most applicable management action, following guidelines outlined within the policy.

In order to comply with this responsibility, the NDOW utilizes USDA- APHIS- Wildlife Services (WS) to control offending mountain lions which are causing or about to cause damage to livestock, wildlife resources, agricultural crops, or personal property and to protect the public from dangerous animals when it is warranted and as authorized by Nevada Administrative Code (NAC) (NAC 503.710 thru 503.740 inclusive). Without the service of WS, the NDOW would, by statute, either conduct the control of offending mountain lions either by themselves or would elect to contract the control work done by other capable entities.

WS, under authority of a NDOW Wildlife Depredation Permit, salvages and submits to NDOW the complete hide and skull and records pertinent biological data such as age, sex, date and place of take. This data provides essential data used to assess the overall impact of mountain lion populations throughout the state. WS targets mountain lions only when specifically permitted to do so on a case-by-case basis by the NDOW.

Nevada State statute requires that the NDOW control offending mountain lions. Further, State statute (NRS 501.376) allows landowners and the general public to kill mountain lions if necessary to protect the life or property of any person in imminent danger of being attacked. Because mountain lions taken by WS are taken to protect livestock, wildlife resources, agricultural crops, or personal property and to protect the public from dangerous animals, and as State statute requires these lions be removed. And, because WS only takes cougars authorized by the NDOW, and because State statute allows for the removal of depredating mountain lions with or without the involvement by the WS program, the WS program has no adverse effect on the mountain lion population in Nevada. Thus, a decision by WS to reduce or discontinue involvement in mountain lion removal would not affect the cumulative impacts on the species in the state.